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SEPTEMBER

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SEPTEMBER, 1947

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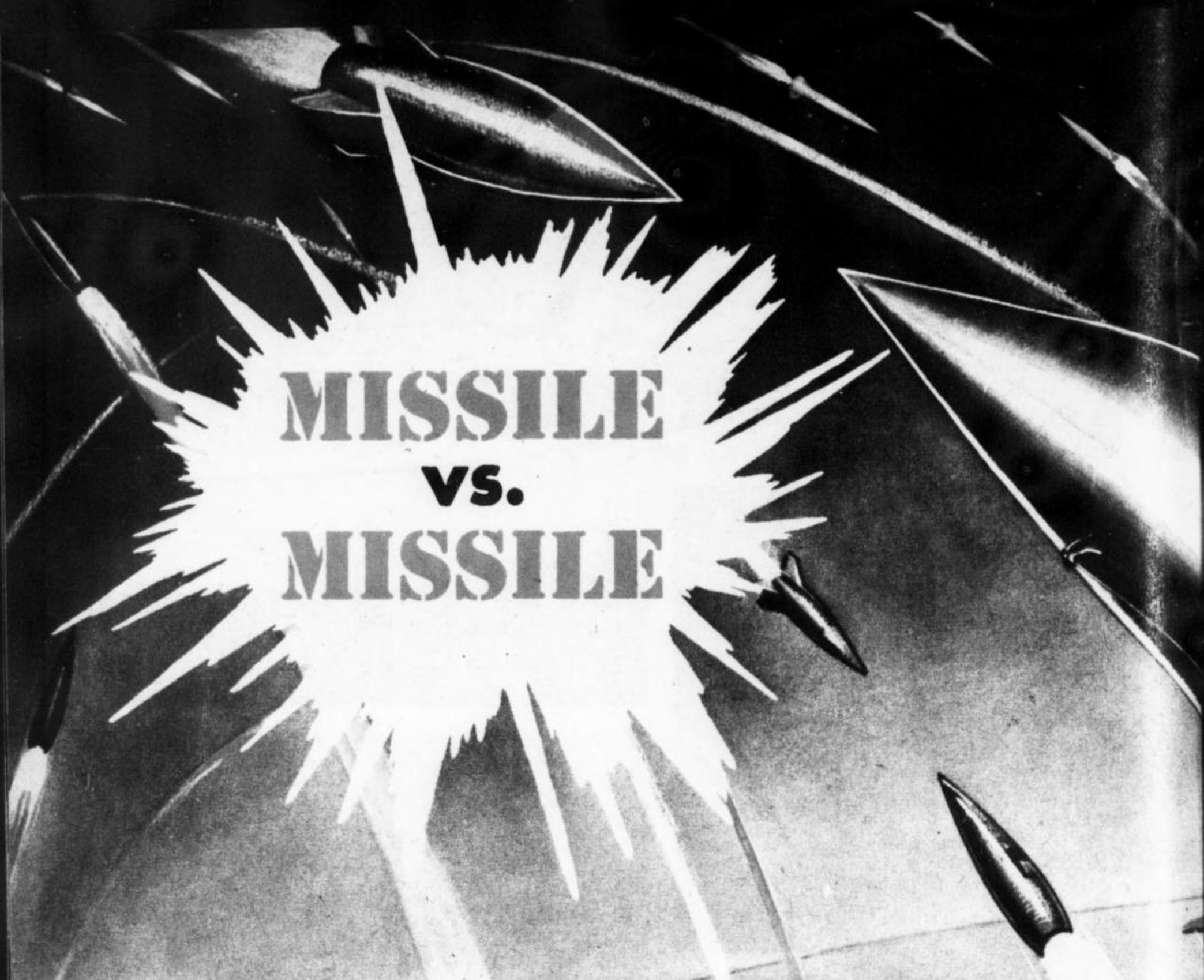
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MISSILE vs. MISSILE

A rocket expert looks at our chances
of withstanding a missile invasion.

BY WILLY LEY

SOMEbody said recently that he would not be surprised if the AAF were re-searching itself out of business, at least as far as flying personnel is concerned. This somewhat surprising statement was based on the fact that a good number of the research projects which have been made known are aimed at high-velocity flight, either true supersonic flight or something close to it. Most of this fast flying would necessarily take place at very high altitudes where there is not too much air to interfere. And since the ramjet, the rocket





and the rocket airplane can be improved more than the pilot, the pilotless missile is bound to be the final result in many cases.

That there are important advantages on the side of the pilotless missile, especially the long-range missile, has been recognized for quite some time. Soon after the end of the war in Europe my friend A. V. Cleaver of de Havilland Aircraft (England) pointed out that V-2 rockets might be actually cheaper than bombers as far as

the delivery of high-explosive is concerned.

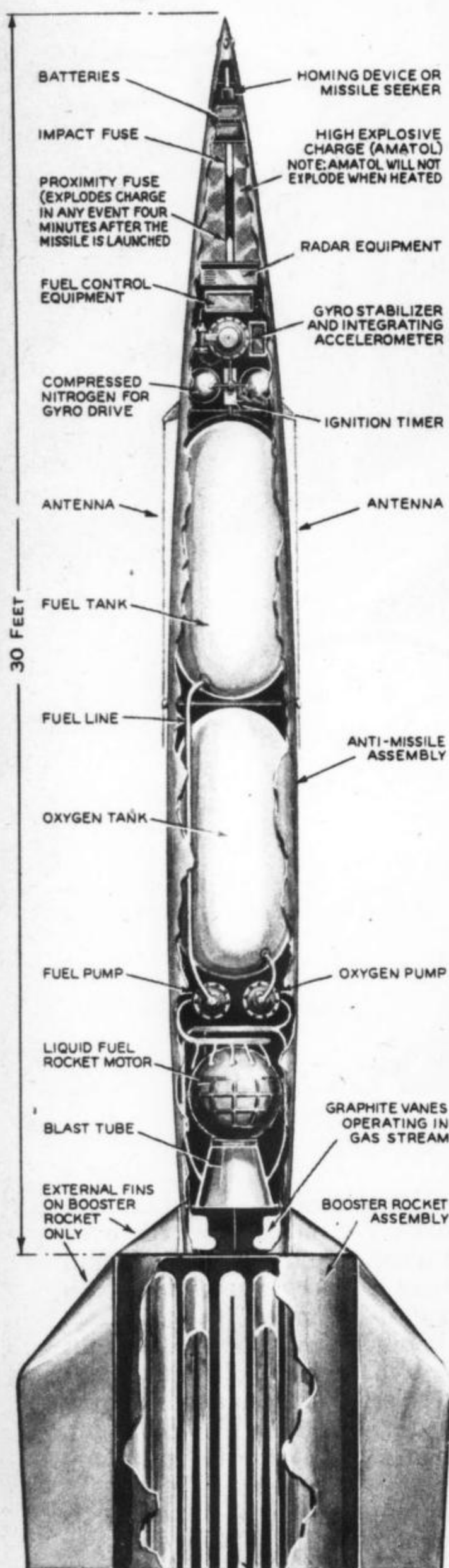
It is true that a V-2 burns up a little over eight tons of alcohol and expensive liquid oxygen in order to carry a one-ton bomb over a distance of 200 miles. It is also true that a large bomber can carry about eight times the bomb load of a V-2; *but it costs over 30 times as much.* It also needs a crew whose training is a big item in the budget. It needs hangars and airports with long runways.

In order to compete with V-2 rockets, as regards poundage of bombs delivered per dollar of expenditure, a bomber would

Left: This radio-controlled, jet-driven target plays the role of an attacking missile for A-A gunners.

September, 1947

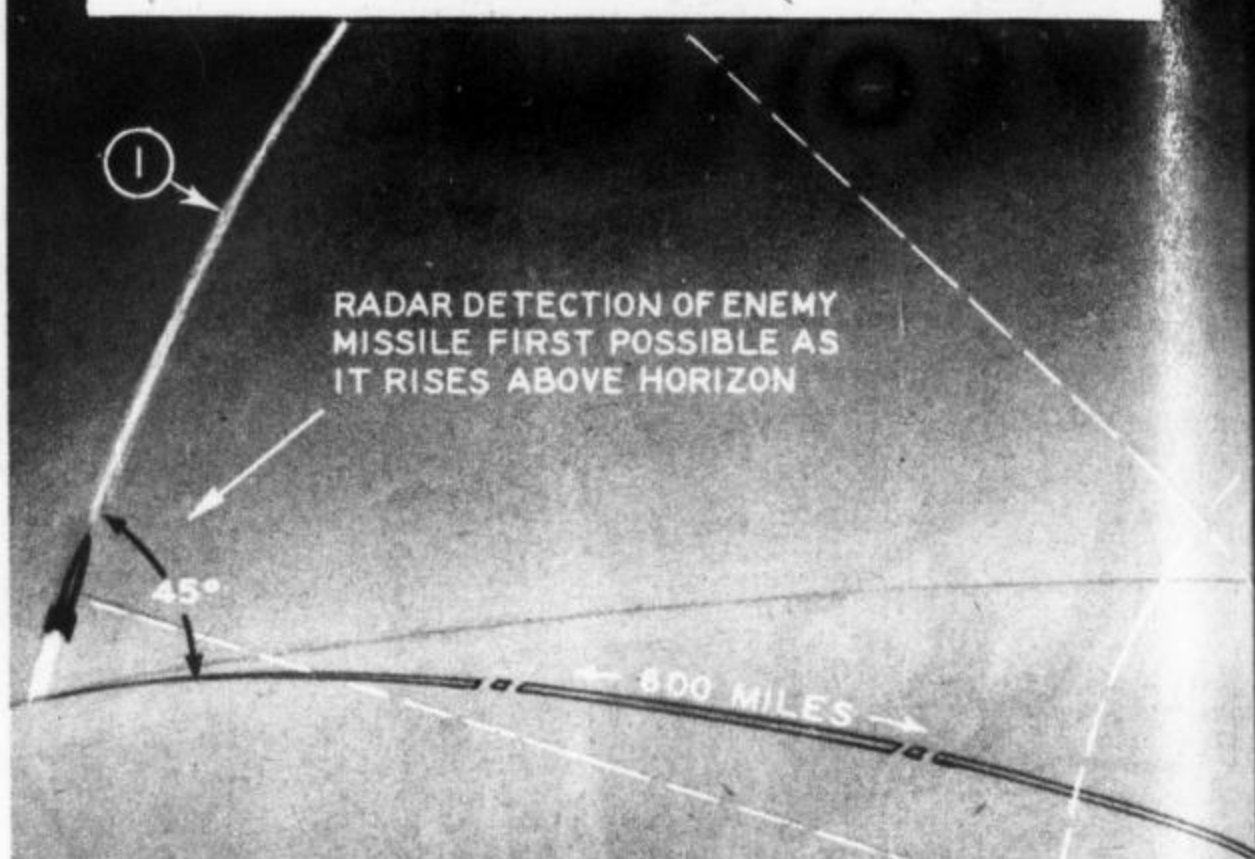
Liquid fuel motor takes over after booster drops off at 10-mile altitude. Ground station activates homing device which seeks attacking missile. Right: Long range attack and defense.



SOLID FUEL BOOSTER ROCKET MOTOR

MISSILE vs. MISSILE - TRAJECTORY KEY

- ① INITIAL TRAJECTORY OF ONCOMING ENEMY MISSILE.
- AA AREA MOST VULNERABLE TO DEFENSE INTERCEPTING ROCKETS, WHERE ENEMY MISSILE IS SLOWEST.
- ② THEORETICAL IMPACT-TRAJECTORY OF E. MISSILE.
- ③ ACTUAL IMPACT-TRAJECTORY OF E. MISSILE FROM 120,000 FEET DOWN DUE TO AIR RESISTANCE.
- ④ PRIMARY INTERCEPTION FROM ADVANCED BASES.
- ⑤ SECONDARY (LAST RESORT) INTERCEPTION FROM BASES LOCATED IN THE ACTUAL TARGET AREA.

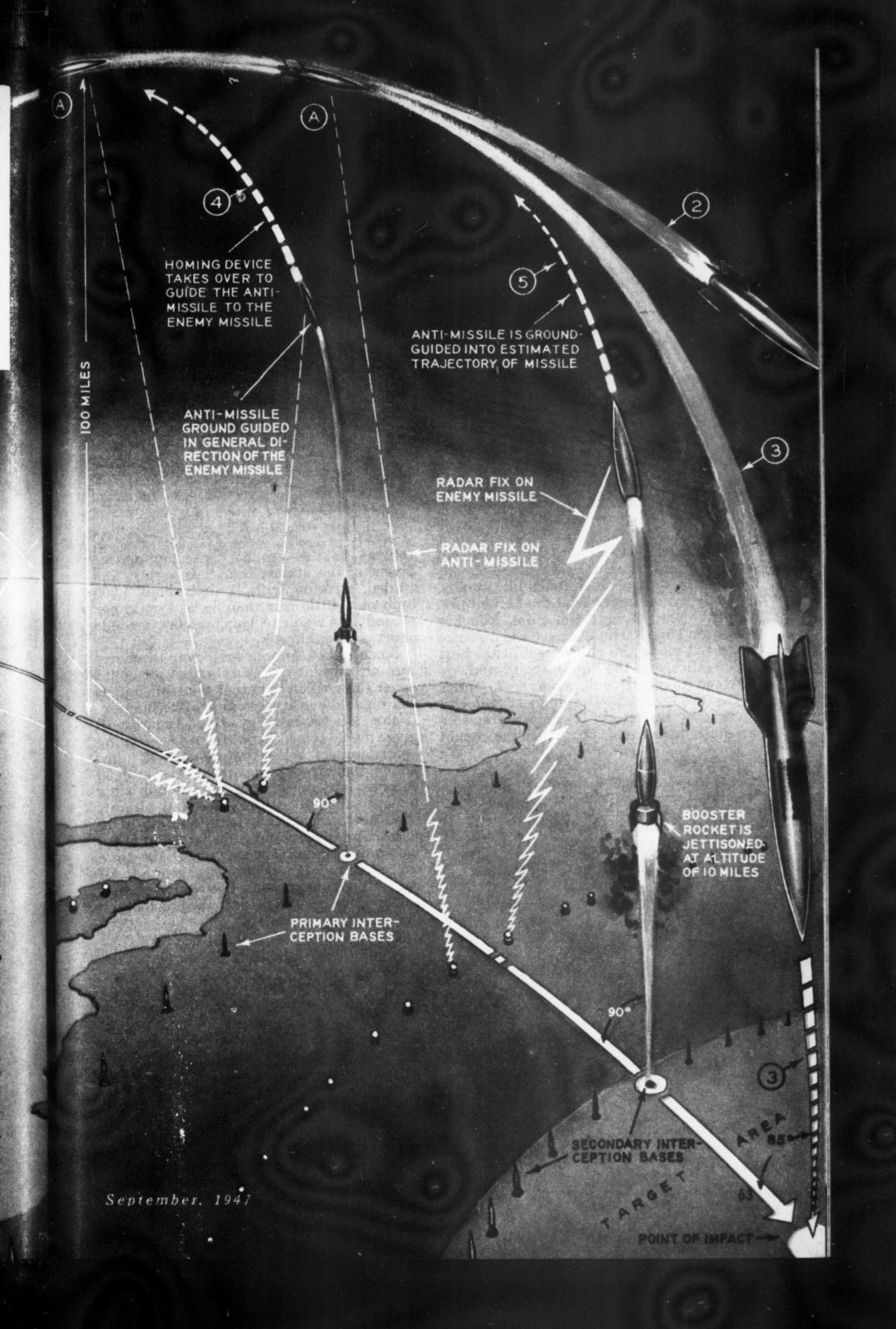


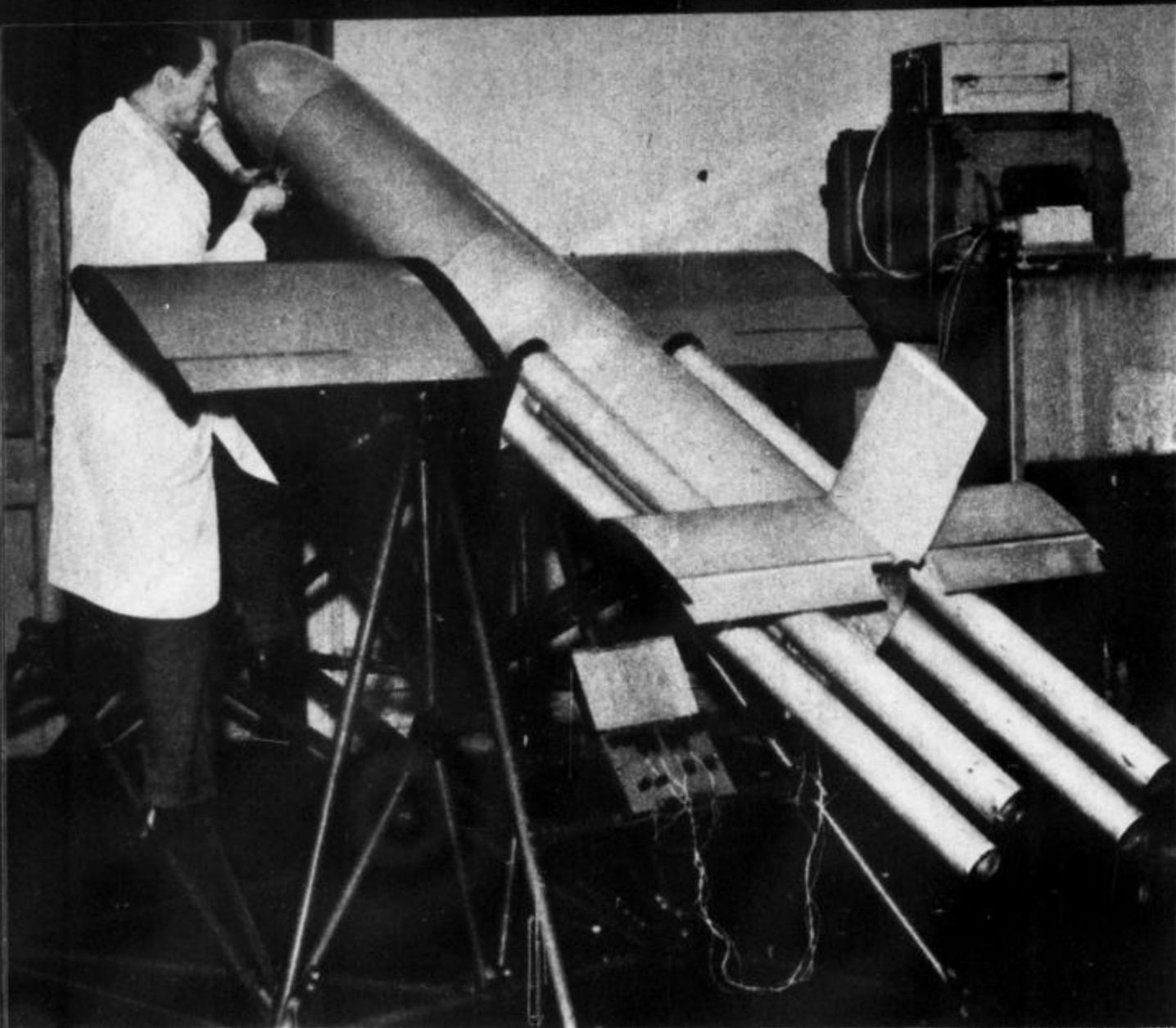
have to fly about a hundred missions before retirement. We all know that bombers, as a rule, did not fly a hundred missions. And bombers can still be grounded by bad weather, long-range rockets are not. Bombers could be intercepted by fighters or from the ground, long-range rockets could not. The only real advantage of the bomber during the last year of the last war, was higher bombing accuracy and longer range.

With atomic bombs accuracy is no longer important.

And the range of long-range rockets can be increased. It may be a tough job to do so, but it can be done. The only open question is whether long range rockets will stay non-interceptible for all time to come. When the V-2 rockets were used, interception was impossible and it would be interesting to learn whether it was tried at all. Londoners saw falling V-2's on occasion, and it is conceivable that an anti-aircraft gunner fired a shot or two. If so, and if he did score a hit, it would probably just have meant that the warhead of the V-2 rocket crashed into the city a few hundred yards away from the point where it would have crashed otherwise.

Could specially designed anti-aircraft artillery, or anti-aircraft missiles do better? Let's see how much space, or rather how much time they would have to work in.





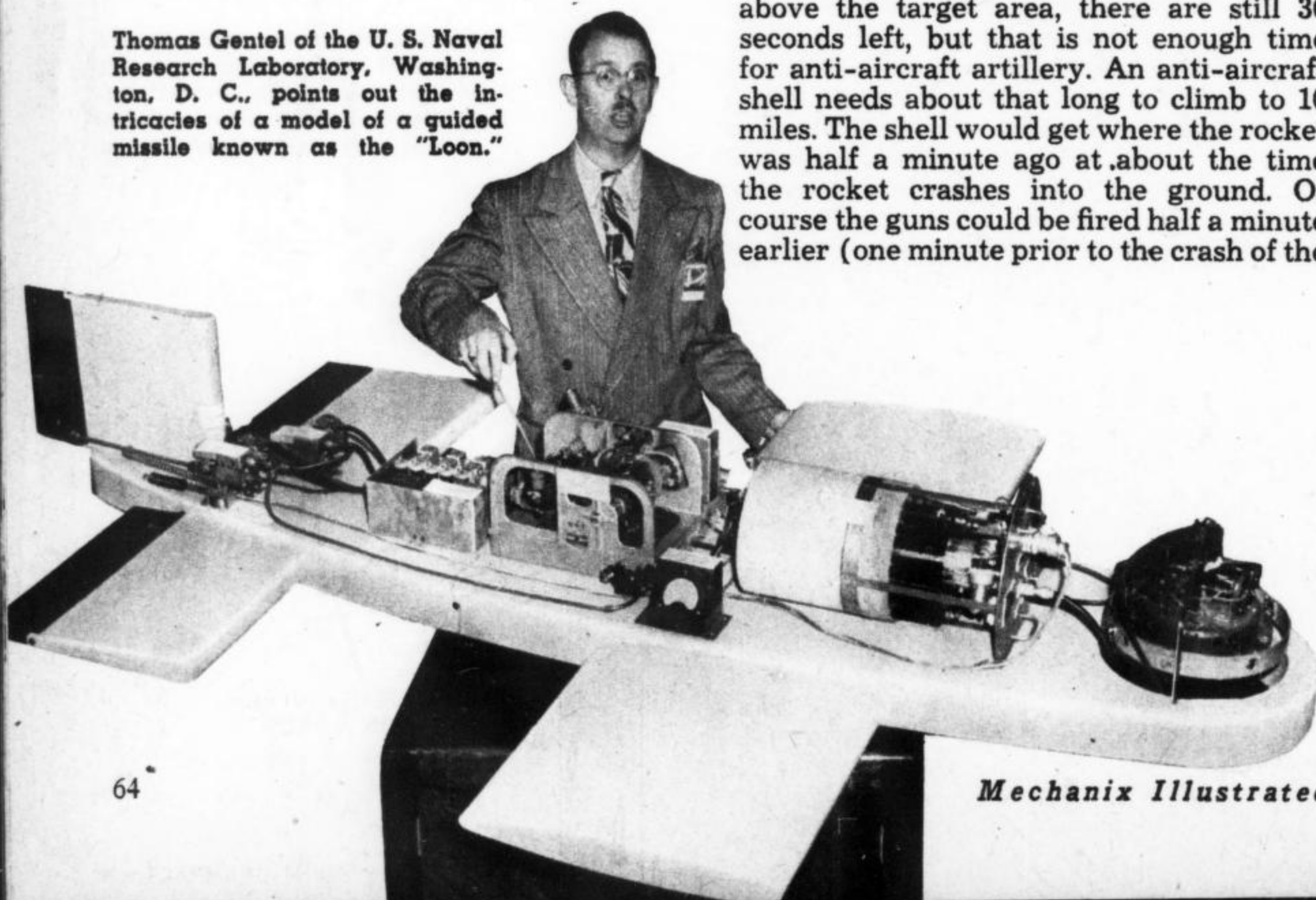
Left: The "Stooge," first pilotless radio-controlled rocket missile developed in Britain. It has range of eight miles, speed of more than 500 mph. Fired from ground base, it can be maneuvered accurately to target. It is considered a weapon of defense—possibly, with future developments, against bombers carrying atom bombs.

A V-2 rocket—to stick to something that is known and in actual existence—travels along a trajectory which looks like, and is, the chopped off upper section of an ellipse. The two points where the ellipse touches the ground are 200 miles apart, the distance measured along the ellipse is a little short of 300 miles, and the highest point midway between take-off and crash is 70 miles above the ground. The highest velocity along that trajectory is almost precisely one mile per second, but when the rocket

returns to the ground, entering denser layers of the atmosphere, it is greatly retarded, striking with "only" about 1,000 mph or a little less than $\frac{1}{3}$ of a mile per second. The whole trip makes a few seconds short of five minutes.

Since radar cannot "see" over the horizon, no present or future radar set could catch the rocket at actual take-off, but it can do so when it rises above the horizon. If the defense is lucky, their radars will give them some four minutes' warning before impact. When the rocket is 12 miles above the target area, there are still 36 seconds left, but that is not enough time for anti-aircraft artillery. An anti-aircraft shell needs about that long to climb to 10 miles. The shell would get where the rocket was half a minute ago at about the time the rocket crashes into the ground. Of course the guns could be fired half a minute earlier (one minute prior to the crash of the

Thomas Gentel of the U. S. Naval Research Laboratory, Washington, D. C., points out the intricacies of a model of a guided missile known as the "Loon."



rocket) at the point where the rocket will be 30 seconds later. But it is obvious that it would need a large and probably practically unfeasible expenditure of anti-aircraft shells to hit a falling rocket. And if a rocket carries an atomic warhead the explosion of that atomic charge a few miles above a city is nothing pleasant to contemplate.

Obviously, interception should take place much earlier than 30 seconds before crashing, and especially at a time when the rocket is not almost vertically over the target area but a large number of miles away horizontally, so that the explosion of the presumed atomic warhead takes place *very high* and at considerable distance from the target area.

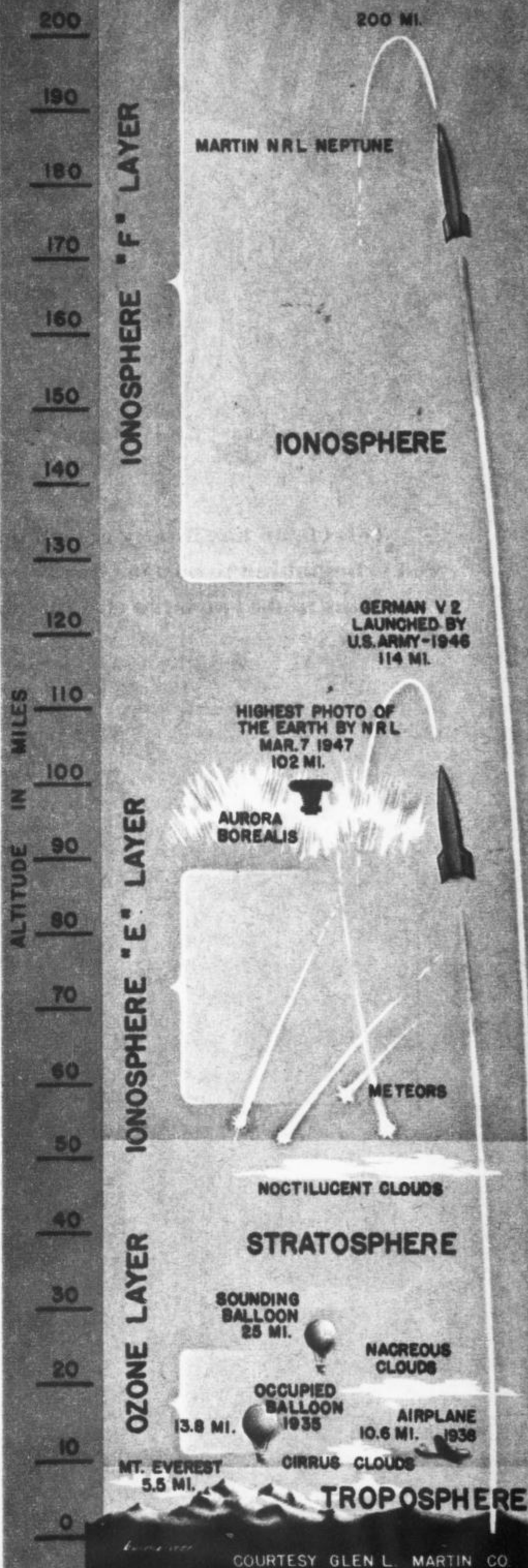
Anti-aircraft guns don't have the necessary long reach to do that, but rockets have. The only possibility for intercepting a long range rocket is another long range rocket. A rocket held in readiness and fired at the instant where the radars catch the enemy rocket rising above the horizon, will theoretically intercept the enemy rocket reasonably near the halfway mark. It would be almost a hundred miles away and some 50 miles up, virtually in empty space where even an atomic explosion would not do any damage.

Naturally you could not intercept a long-range rocket at such a distance simply by aiming at it. The intercepting rocket would need special devices and the weight of these special devices would probably cause the intercepting rocket to be as large as the attacking rocket. Guiding the intercepting rocket by means of radar leaps to mind as a possibility, but to be reasonably accurate, even with a proximity fuze and with a defensive atomic warhead, would require several ground radar sets, spaced far apart.

It sounds more likely to equip the intercepting rocket with a homing device. We can assume that the attacking rocket is hot. The skin of the attacking rocket must have heated up on its upward path even if not as much as it will heat up on the downward path. The ascending rocket is slowest where the air is densest near the ground, while the descending rocket is fast in the dense air. And the rocket motor, even if cooled, must still be radiating some heat a few minutes after burning. This should be enough for a sensitive heat device. And it is hard to see [Continued on page 170]

Right: Drawing shows heights various objects have reached above earth's surface. Atomic missiles could—theoretically—be intercepted safely 50 miles up and 100 miles away horizontally.

September, 1947



COURTESY GLEN L. MARTIN CO.



YOUR FUTURE CAR!

MI's auto expert, Tom McCahill, went to the car manufacturers and got the straight dope on what you can expect in the coming decade.

Top: We liked this but Tom says it's just another pipe dream. Right: Studebaker will soon get credit for standard appearance.



SLEEK, beetle-high cars with retractable wings and power plants capable of jet-like acceleration, even when climbing Pike's Peak, are some of the things many Americans have been led to believe were a matter of months away. We have dreamed or thought of the day when our American cars would resemble Buck Rogers creations and perform accordingly. As the war drew to a close, we heard rumors of super streamlined beauties in the works which would make anything we knew of automobiles in the past seem antiquated.

So what happened? Instead of super

designs with super power plants, the post-war 1946 offerings were, for the most part, poorly disguised pre-war models. Many manufacturers had gone chrome happy in dressing up the front ends of their new cars so that they looked like the familiar juke box in the corner drugstore. A few added a bit of horsepower but, essentially, all were just yesterday's stew with a bright dash of tabasco to keep things from getting monotonous. Studebaker got the jump on the others, however, by first bringing out a 1946 old hat and quickly shelving it a month or two later to introduce a really new type

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of body design, and most automotive authorities feel Studebaker will be getting the credit for a standard appearance when all cars will look like 1947 Studebakers to one degree or another before 1949.

Industrial designers cause a lot of ulcers among the manufacturers with hopped up creations which are pictured in our press from time to time symbolizing what future America will look like. All of us have seen their wild fantasies depicting future automobiles, worm high above the ground, tapering to a needle point many yards astern. We have seen pictures of automobile interiors that made Cleopatra's quarters on the royal barge look like the left wing of a flop-house, power plants so sleek and streamlined you couldn't even get fuel into them, and other surrealist pipe dreams.

Another fellow who causes unrest among our motoring public is the feature writer who interviews these geniuses and then writes articles practically advising all car owners not to be too anxious or hasty in buying a new car, because just beyond the horizon is the car of the century with hot and cold running carburetors, and so forth. You've read these articles and so have I, but as the automobile manufacturers are the ones who have to make all these gems, perhaps their opinions on future transportation might prove a little more accurate, if not as colorful reading. They are the ones who will have the

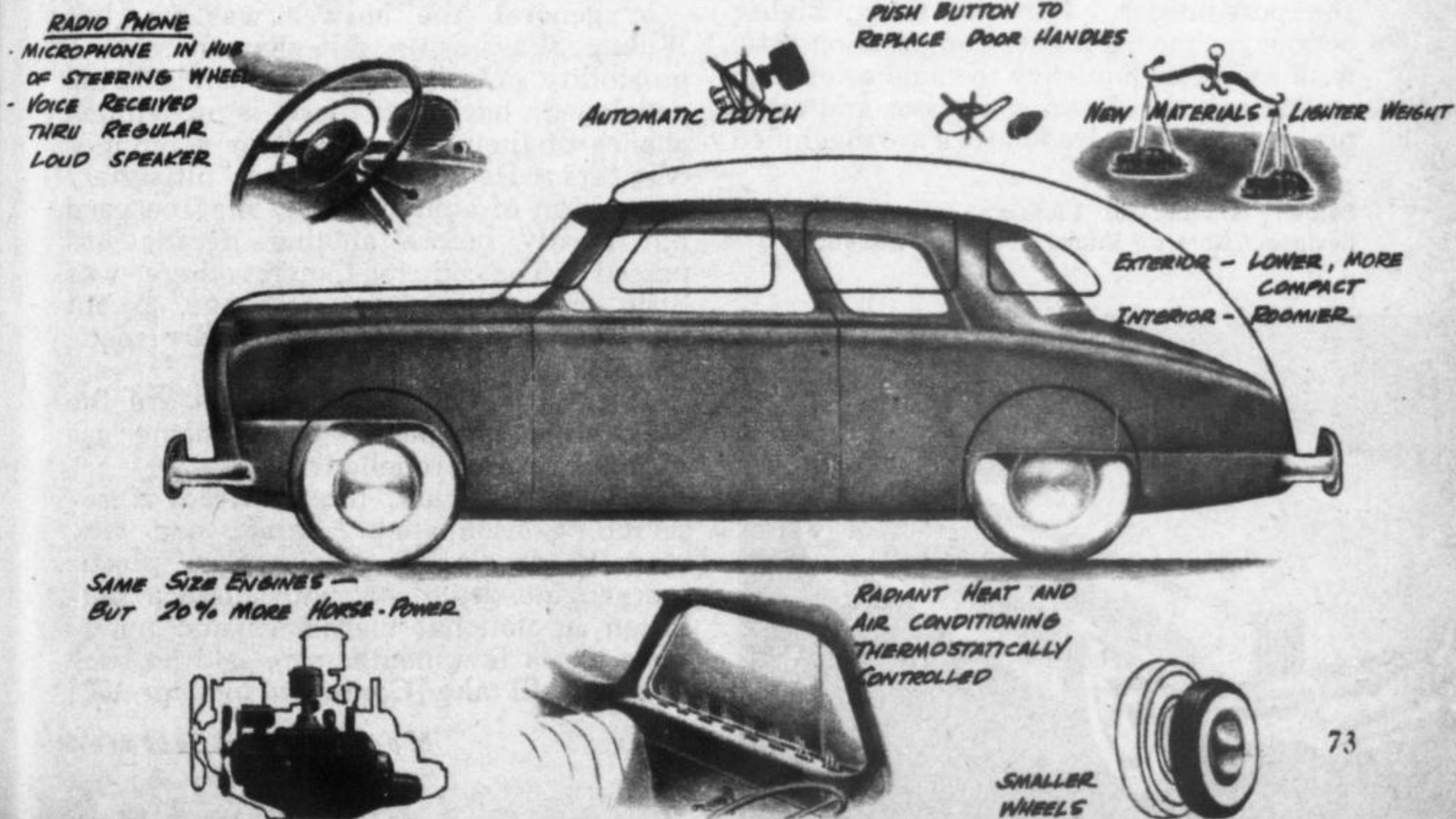


Will rear drives be popular in five years? Most car makers say "possible but not probable." One favors Flajole's design, above.

final say when it comes to different power plants, rear-end drive, and all other additions or changes including size and body design.

With this in mind, I contacted executives and chief engineers of every major automobile company in America. Besides these I questioned independent designers and automotive authorities from coast to coast. I asked them all the same questions and though I got a variety of answers many of them ran in such similar pattern that a number of definite conclusions come out about our automobiles not only a year or so from today, but ten years from now. Of course, in ten years many things can happen that can alter some of these ideas but a lot of them will stand. However, what's most revealing is how the important brains of the automotive

Below: Composite drawing of changes already in the works. Car outline contrasts most present body designs with what you can expect in all cars in the near future.



industry are thinking today. Before continuing, I must say the executives and chief engineers of two companies refused to answer my questions but all others cooperated fully.

The first question asked was "Do you expect the engines of future cars to be designed to use 100-octane fuel or higher?"

The answer to this was in general no, but with two notable exceptions. Wilbur Shaw, only three-time winner at the track of which he is now President, Indianapolis Motor Speedway (where just about every known mechanical part and design on our present automobiles were developed), feels that our engines in the near future will be operating on 100-octane gasoline. I cannot stress too strongly what Shaw's opinion means, as he is in direct contact with nearly all racing developments and, though few may realize it, our present cars were race cars just a few years ago. To illustrate: this means your four-wheel hydraulic brakes, spark plugs, tires, shock absorbers, steering geometry, frames, rear axles, present fuel, oil, short stroke, high compression engines, carburetion, spring suspension, pressure cooling and dozens of other features, all sprang directly from the Indianapolis track and no place else. So, you can see how Shaw's thoughts may, in some cases, indicate definite eventualities regardless of the manufacturers' views on the subject at the moment.

Harold T. Youngren, vice-president in charge of engineering at the Ford Motor Company, also feels 100-octane gas will be used but not for some time. His point being that, though we realize higher octane gasoline means more power and economy of consumption, a number of changes must take place before we are ready to utilize the possibilities. For one thing, higher octane gas means higher compression ratio with a greater tendency to rougher or high strung engine. Bearing stresses and other problems of a kindred nature are magnified

Below: Another of Flajole's rear-engine designs. Note air intake over rear wheels.



New designs will mean more room inside without increasing the over-all width.

many times. Youngren does feel, though, that this higher rate of fuel will be used when new combustion chambers are designed to promote a more uniform burning rate, at the same time eliminating peaks of explosion pressure that would now produce roughness and spark knock. It is also wise to remember, as he points out, that though higher octane gasoline, alcohol and other fuels offer a bright promise, a price factor comes into this, plus availability and distribution at our present comparatively low cost of gasoline.

So—what is the answer to number one? Most engineers feel that the gas octane rating will remain much as it is, whereas Shaw and Youngren, two wideawake and progressive engineers themselves, feel there is a place eventually for premium fuel.

The second question also pertained to fuel. The question was "Do you think there is a possibility that a different type of fuel may be used, such as alcohol and benzine or perhaps atomic energy in some form?"

In general, the answer was no, but Wilbur Shaw again felt that there is a possibility of solids or semi-solids being developed, but that there is not much chance of their being used for a number of years. He also feels that ultimately some form of atomic energy may be used but hardly before another decade has passed. The others thought there was little or no chance for a change, except for Youngren, whose remarks are mentioned above.

The third question was "What are the chances of the power plants being gas turbines or jet propelled?"

William B. Stout, former head of research, Consolidated Aircraft, and who recently developed a spun-glass plastic rear-engine-drive car that caused a sensation in national magazines and newsreels just a few months ago, said no such changes will take [Continued on page 162]

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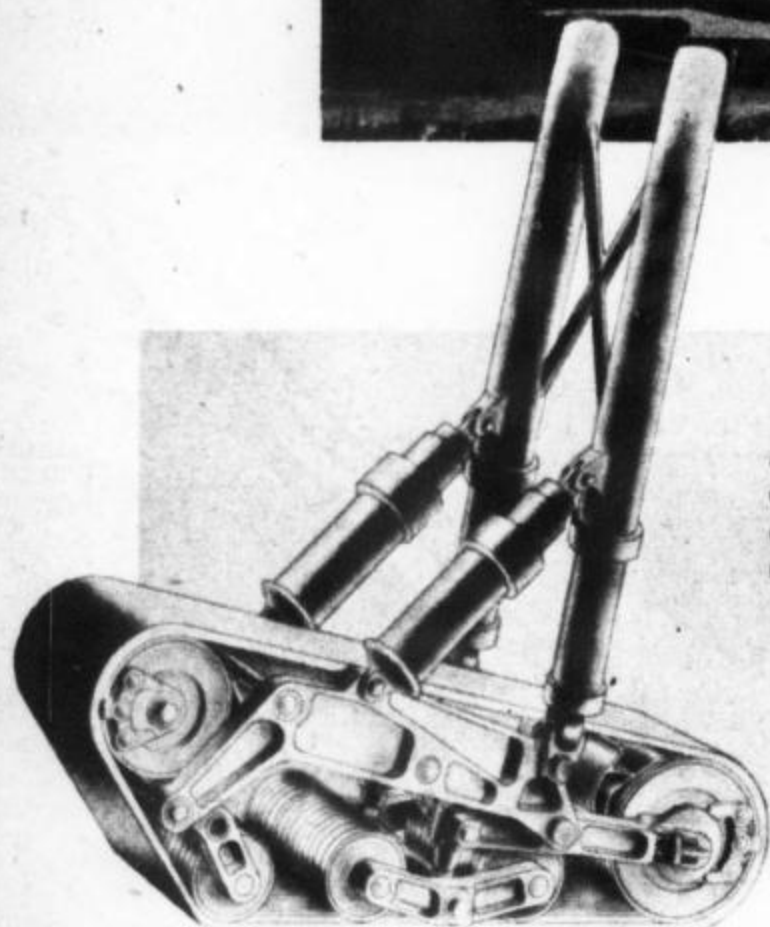
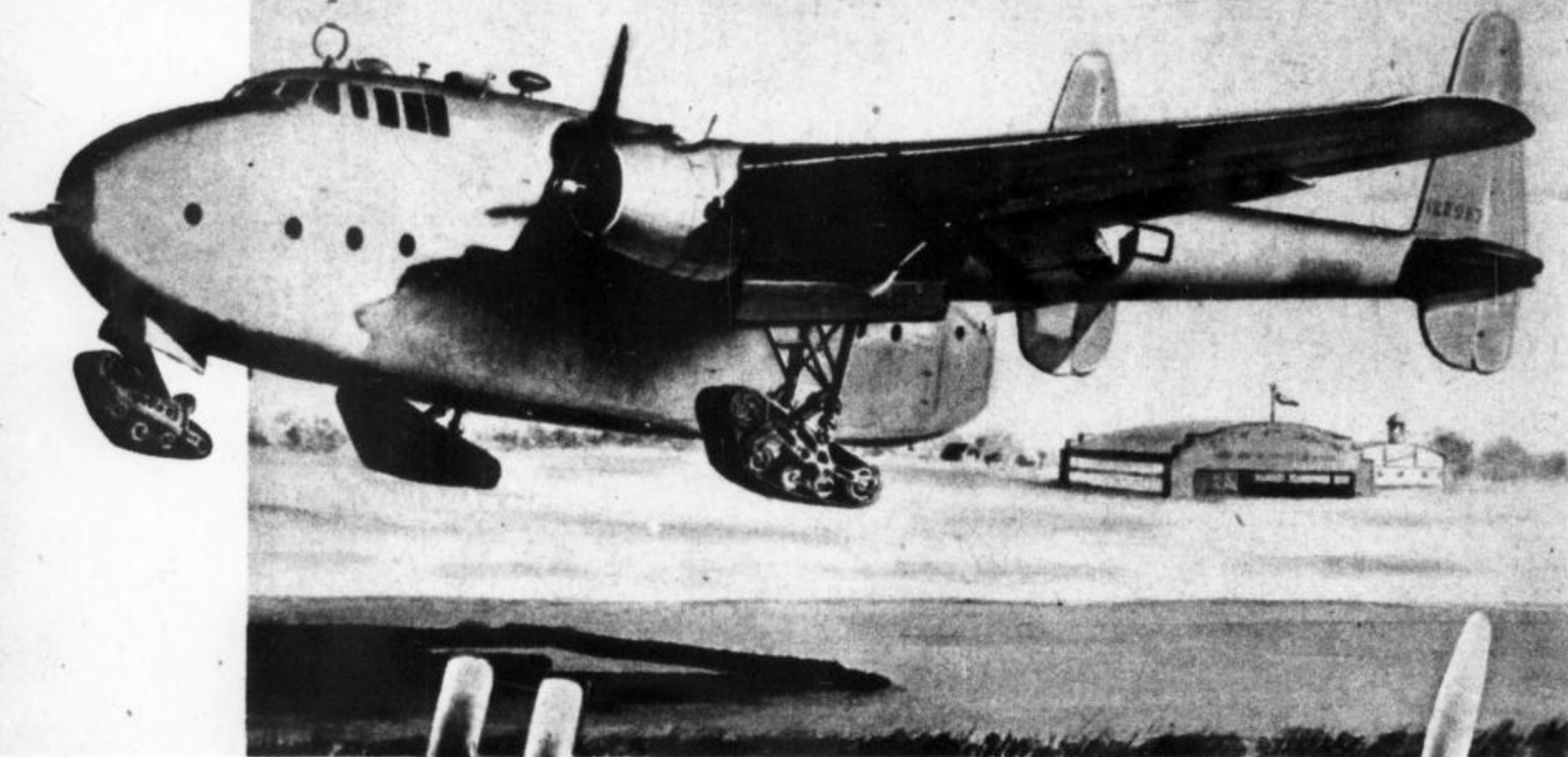
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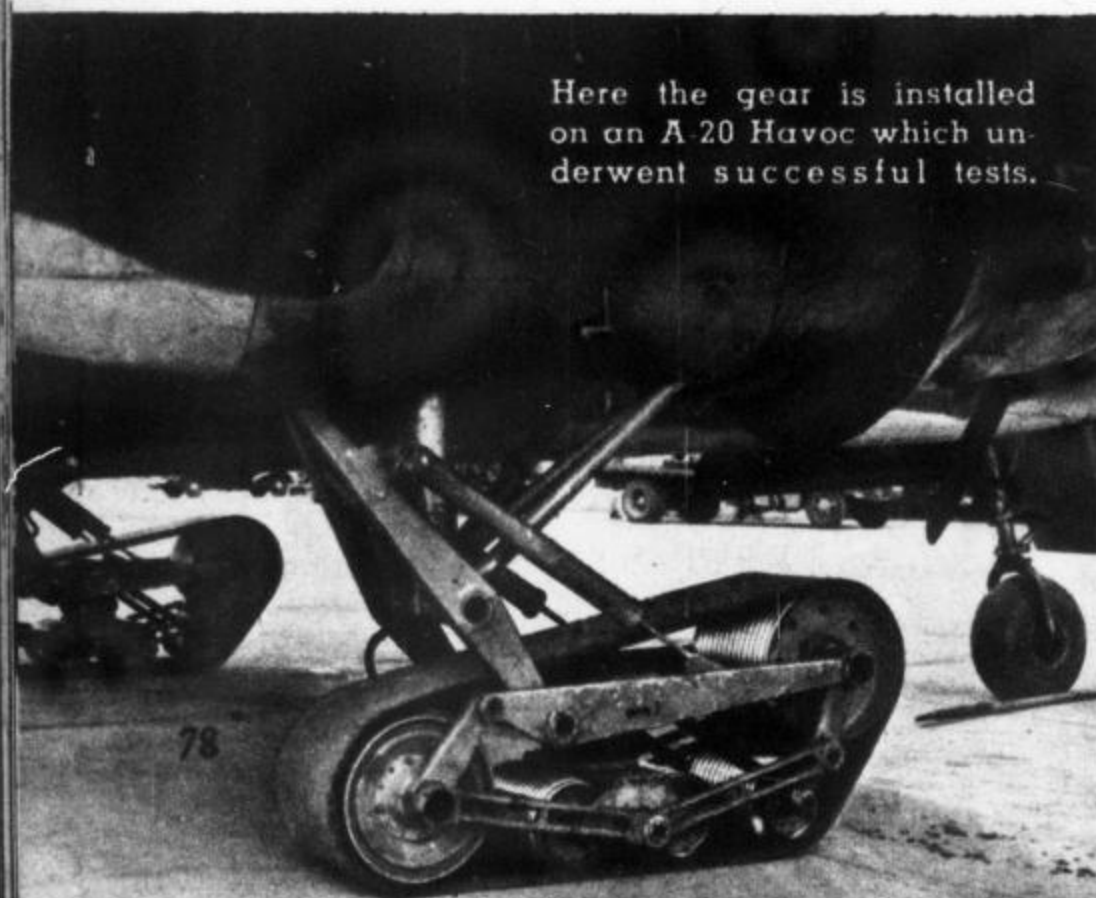
Air Freighters Have New Feet



Above: Fairchild C-82 Packet equipped with tractor type landing gear shown in detail in closeups. Gear permits soft surface landings.



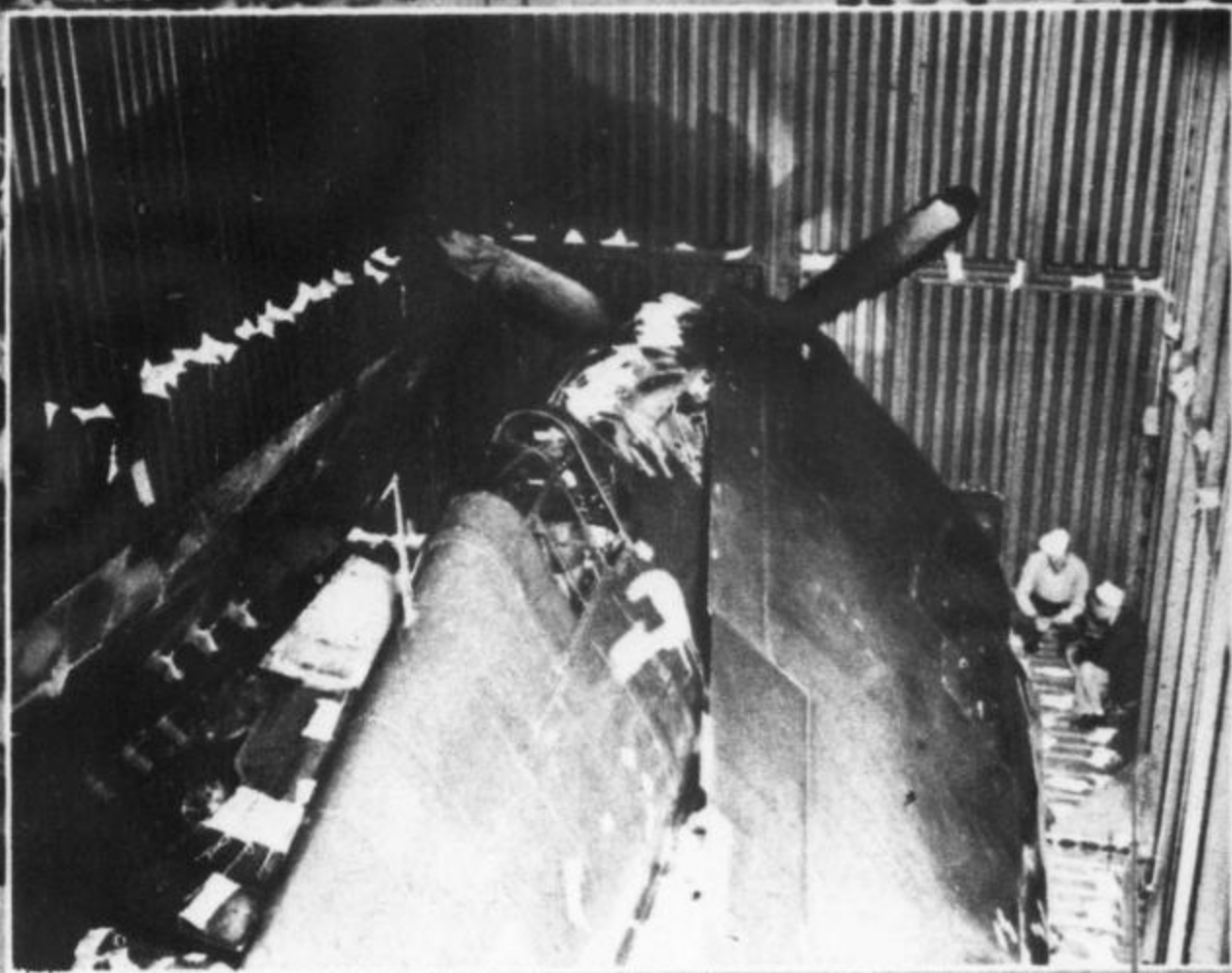
Here the gear is installed on an A-20 Havoc which underwent successful tests.



THIS new tractor type landing gear, now undergoing tests at Air Material Command headquarters, Wright Field, Ohio, is designed to enable heavy planes to land on runways which are not concrete-covered. The gear, which is similar to that used on tanks and was developed by the Firestone Rubber Co., was originated by the AMC early in the war. In present tests on heavy cargo planes, a rubber-wire cord combination has been found most efficient. Attempts are being made to develop a light-weight gear. •

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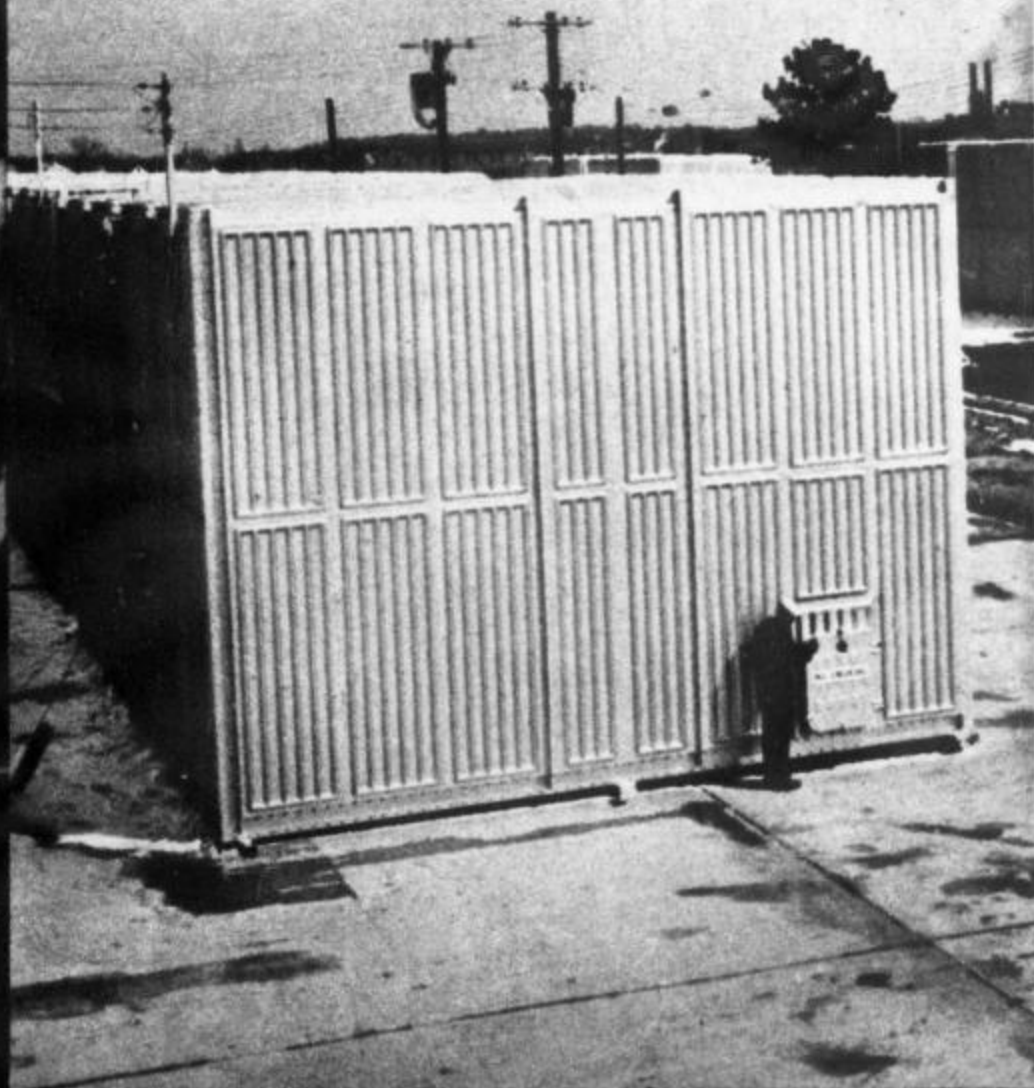
Canned Airplane



THE Navy has begun "canning" more than 2,000 surplus carrier and trainer aircraft, to preserve them in near fly-away condition for periods up to five years.

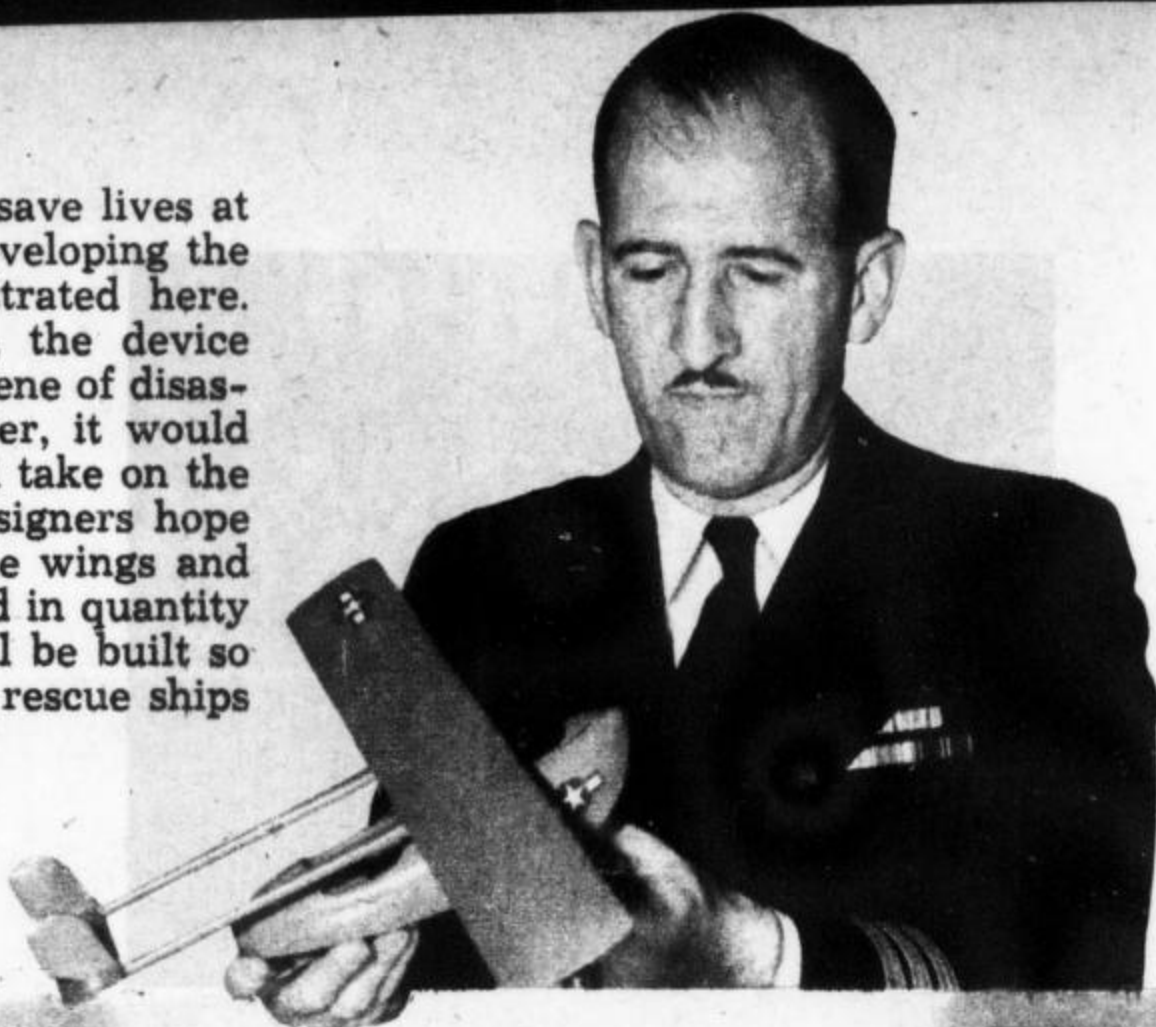
The "canning" process seals the complete planes, with wings folded, in metal containers constructed from 10-foot panels of corrugated steel.

In each "can" relative humidity is kept at 30 percent. Vapor-tight access doors afford entry for inspection, and glass windows allow easy reading of five instruments that indicate temperature and relative humidity.



IN ITS unceasing efforts to save lives at sea, the Coast Guard is developing the glider-boat rescue unit illustrated here. Towed by powerful aircraft, the device would be released over the scene of disaster. After gliding to the water, it would jettison its wings and tail and take on the function of a motor boat. Designers hope eventually to make use of the wings and tail of CG4A gliders, produced in quantity during the war. The craft will be built so that it can be hoisted aboard rescue ships arriving upon the scene. •

Right: Comdr. R. D. Schmidtman, USCG, with model. Below: Conception of rescue plan at work.



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COVER BY TOM McCAHILL

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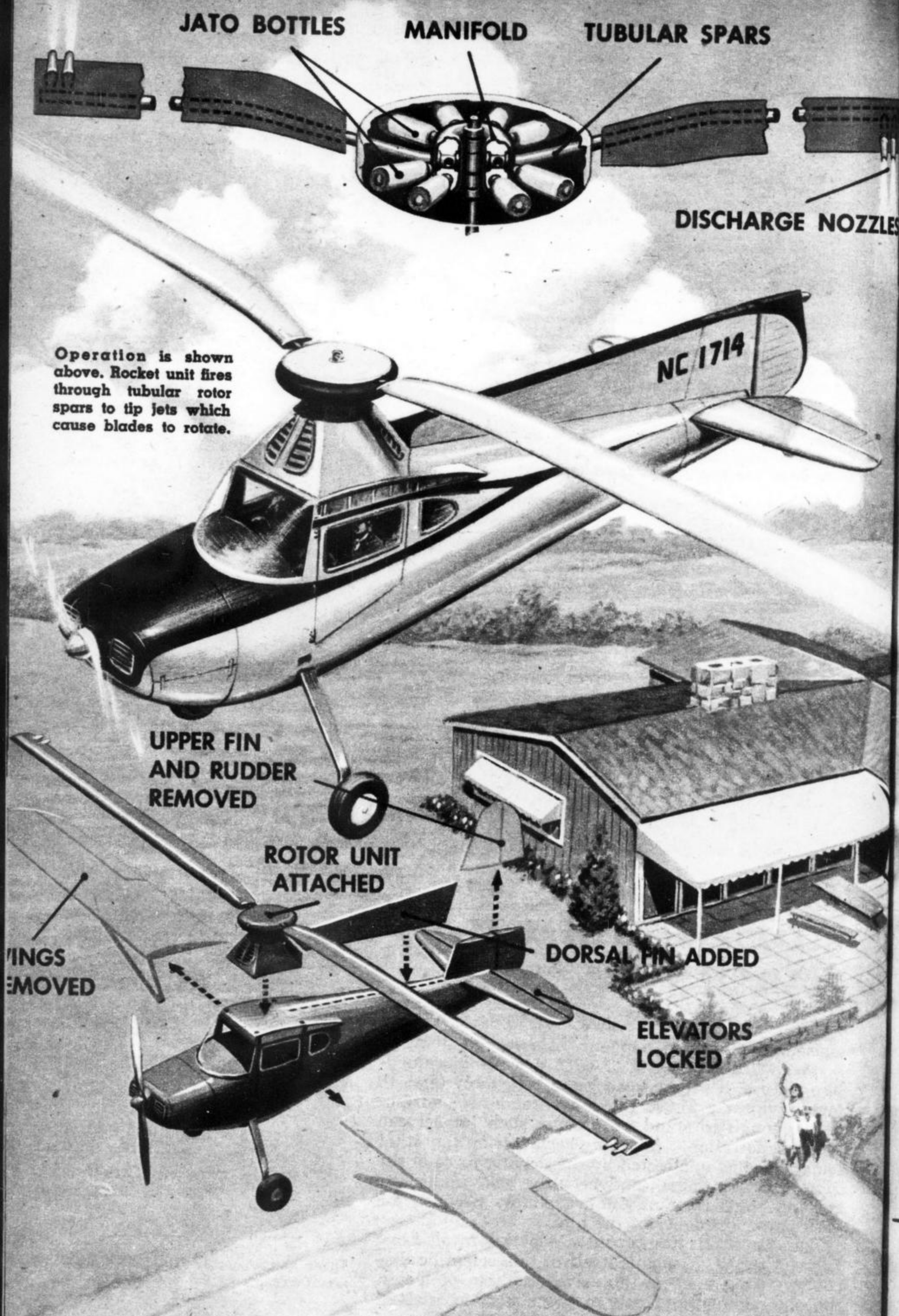
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Operation is shown above. Rocket unit fires through tubular rotor spars to tip jets which cause blades to rotate.

UPPER FIN AND RUDDER REMOVED

ROTOR UNIT ATTACHED

WINGS REMOVED

DORSAL FIN ADDED

ELEVATORS LOCKED

Make Your Plane A Helicopter

With a few alterations, hook on Nagler's rotor unit and you'll be able to take off straight up.

By Joseph Wherry

AUSTRIAN-BORN Bruno Nagler's Convertaircraft caused a lot of excitement among air-minded folk during the International Motor Sports Show in New York's Grand Central Palace. At first glance the aircraft looks like a helicopter. But a second look reveals a reciprocating engine and a propeller mounted out in front on a very familiar Aeronca fuselage.

Nagler, known throughout Europe for his experiments in vertical flight for more than two decades, is in this country under the auspices of our government. And, according to him, private flyers and those who contemplate the future use of a really practical aircraft—one that has the functional utility of an automobile plus the horizontal speed of a conventional light plane—will not have too long to wait.

The story starts prior to 1930 in Austria but it was not until that year that Nagler secured the basic European patents, the first in the world, for the swash plate, the device now used in helicopters to allow the rotor to change its pitch as it revolves, thus producing horizontal motion of the aircraft. In 1933 the U. S. Patent Office also granted Nagler a basic patent on his new principle.

Nagler admits that the now obsolete autogiro served to stimulate interest in the possibility of vertical flight. Unsuccessful due to its inability to ascend vertically for more than 10 feet or so at a time, the autogiro did serve a useful purpose in developing the technique of vertical landings by means of auto-rotation, or free wheeling of the rotor as the aircraft descends in a controlled path.

Vertical flight requires a powered rotor.

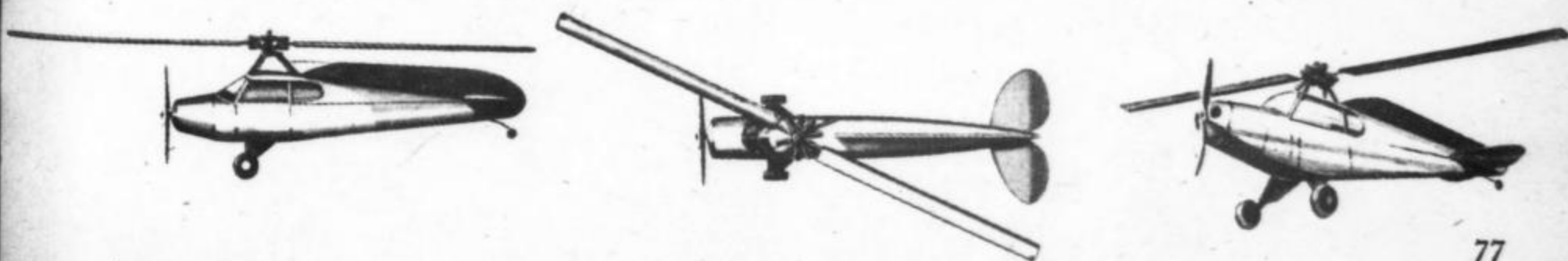
The autogiro's rotor was powered only for the time necessary to effect a takeoff. The power was then disengaged by a clutch and the rotor windmilled and provided lift only so long as the autogiro's conventional engine-propeller combination furnished forward thrust. The lift of the rotors was never sensational and after about three decades of labor, designers eventually gave up their efforts about the time the Second World War began.

The trouble with the autogiro was that the fuselage-mounted power plant, when geared to the rotor, caused excessive torque which rendered it inherently unstable and incapable of useful controlled vertical flight. The autogiro did have remarkable take-off and landing characteristics but its load carrying and climbing abilities were so nearly nil that further experiments were unwarranted.

The only thing the autogiro really proved was that properly powered, the rotor was capable of lifting considerable weight and, if a method of control were achieved, could be made to substitute adequately for a fixed wing.

The adoption in the late '30's of Nagler's swash plate in combination with a stabilizing tail rotor that counteracted torque resulted in the modern helicopter which has completely eliminated the engine-propeller arrangement in the nose. The result has been amazing. In ever-increasing numbers the 'copters have become a familiar sight on both military and civilian scenes; they are the answer to vertical take-offs and landings but they are not the best answer to forward flight. They are too slow and their load-carrying ability is limited.

Three views below show conventional fuselage, pylon and rocket gang, and dorsal fin.





Nagler's new 65-pound Heliglider climbs vertically like a 'copter, glides like autogiro. It straps on, has 15-foot rotor blade, rocket motor.



Nagler and his one-man Heliglider in Austria in 1943. It ascended vertically, was powered by two small engine-propeller units housed in rotors.

Research discloses that five per cent of the total flight time of the helicopter is devoted to either ascending or landing. Thus only five per cent of the time the 'copter is in use is it actually doing what it is specifically designed to do. The remaining 95 per cent of airborne time is a costly and slow flight in a horizontal path—inefficient at best, with forward speeds of no more than 120 mph. It's a fact that flying a helicopter is unusually fatiguing due to a complicated control system and merely to learn to fly one requires a longer period of instruction than a conventional aircraft.

At about the time the Curtiss-Bleeker helicopter in America was trying to fly by means of a tremendously ponderous rotor propelled by small engine-propeller units on the blade tips, Nagler was on the same track in Austria. One of his machines featured a canoe-like nacelle upon which was mounted a fragile three-bladed rotor powered by a small gas engine below. To

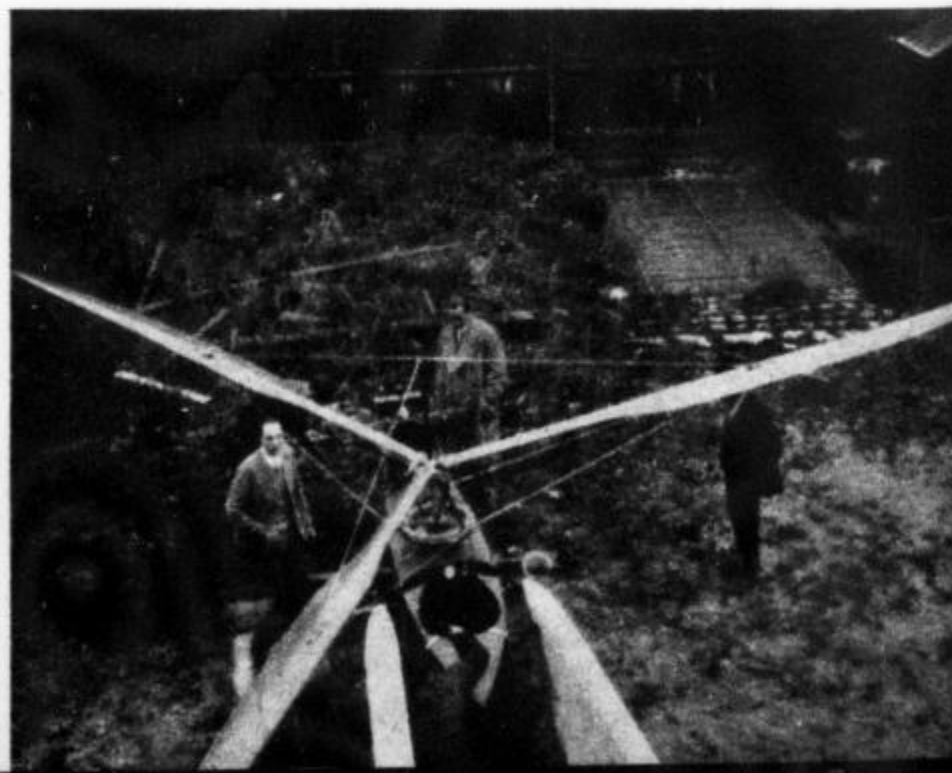
counteract torque, Nagler devised two fins with thick airfoil cross-sections mounted vertically behind the canoe. The whole affair was mounted on skids and did manage to get a few feet off the ground before the torque overcame the balancing action of the leaf-like fin sections.

Next came a device that looked something like Howard Pentacost's original Hoppicopter. There was a decided difference, however. Unlike the Hoppicopter, Nagler's pinwheel carried its rotation power right in the rotors in the form of one-cylinder gas engines driving small propellers which were mounted on each of the two rotors. The vertical stabilizing fin was for steering only; the rotors, because of integral power, had no torque and so were inherently stable.

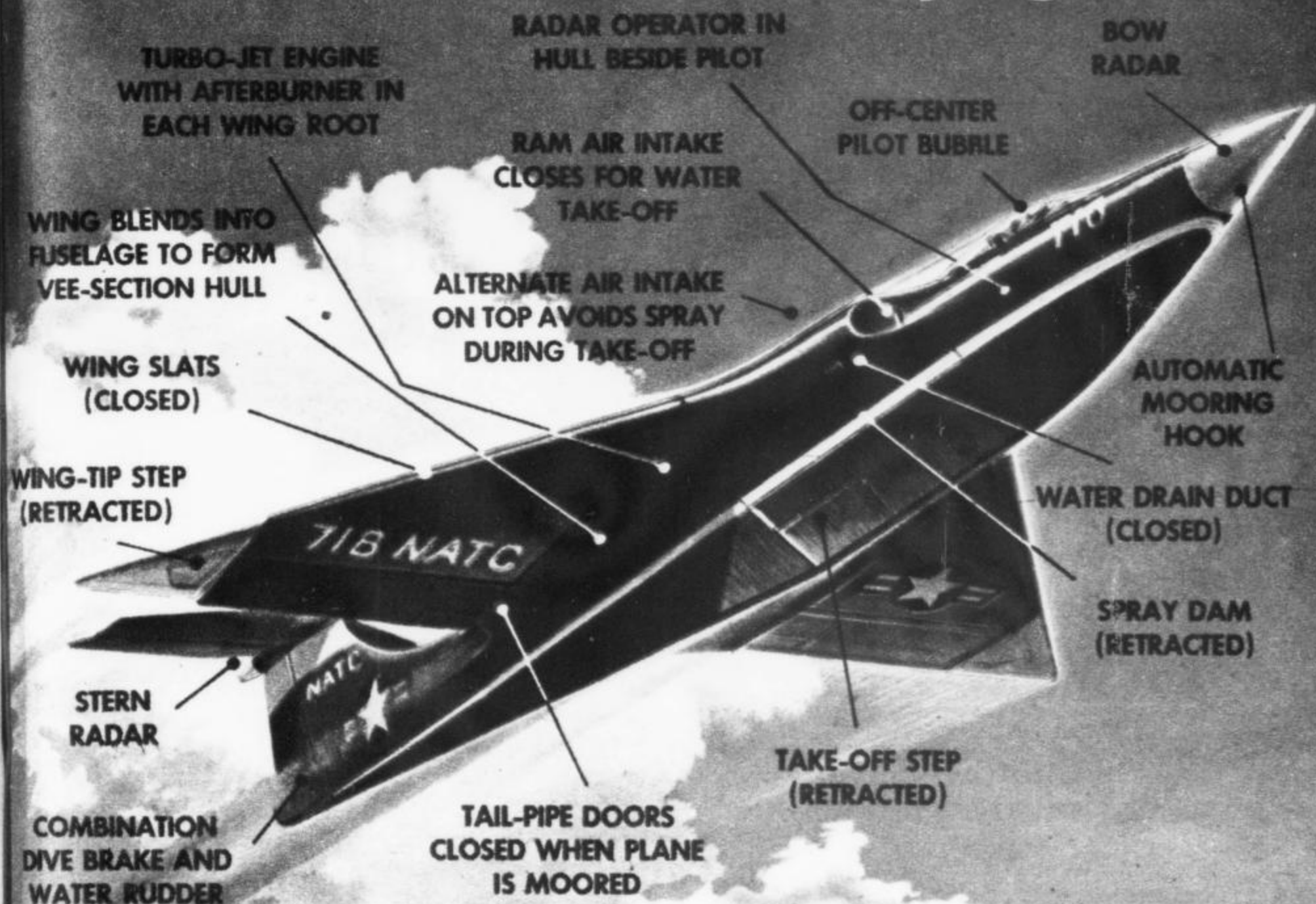
Due to the rapid development of jet and rocket propulsion, Nagler was one of the first to realize the potentialities of his earlier experi- [Continued on page 206]

Convertaircraft mock-up. Rotor hub indicates place which will eventually be occupied by multiple gang of small solid-fuel rockets for power.

Revo-plane of 1929 had a canoe-like nacelle and three-bladed rotor, used swash plate to change pitch of rotor blades when in horizontal flight.



America's First JET Flying Boat



LAST year's flying boat is going the way of the dinosaur. Jet power is the magic wand that has turned the trick. No longer is a high, narrow hull needed for propeller clearance. No more clumsy, wing-tip floats keep the ship from capsizing. The new Skate squats on its broad, stable bottom and rides the swells like a seagull.

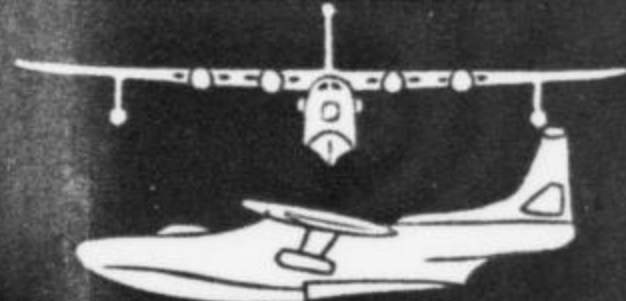
Consolidated Vultee's Ernest C. Stout is the magician. In his new design is the smooth blending of the wing roots into the fuselage and the result is a shallow, broad beamed, vee-bottom hull. Engines are contained in the thick wing roots and fuel tanks are in the fuselage. High take-off spray is countered by a retractable spray dam which deflects it downward and intake air is sucked in above the wing until the plane leaves the water. Then ram-air intakes are opened.

Models Eight and Nine of this plane are under secret test. The supersonic model shown here is based on Convair's XF-92A experimental fighter. Navy says, "Water-based jet fighters? We can use 'em!" •

DEVELOPMENT OF BLENDED HULL

FRANK TINSLEY '51

CONVAIR XP5Y-1 TURBO-PROP FLYING BOAT
SHOWING LATEST HULL LINE IN USE



CONVAIR SKATE NO. 1 JET FIGHTER
SHOWING WING FLEET BLENDED INTO HULL



SKATE NO. 2 WITH SHARP WING AND VEE
TAIL SHOWING IMPROVED STREAMLINING



New York's Rubber Subway

HOW would you like to shuttle across town in a quiet, vibrationless subway train that rides smoothly on an endless rubber conveyor belt?

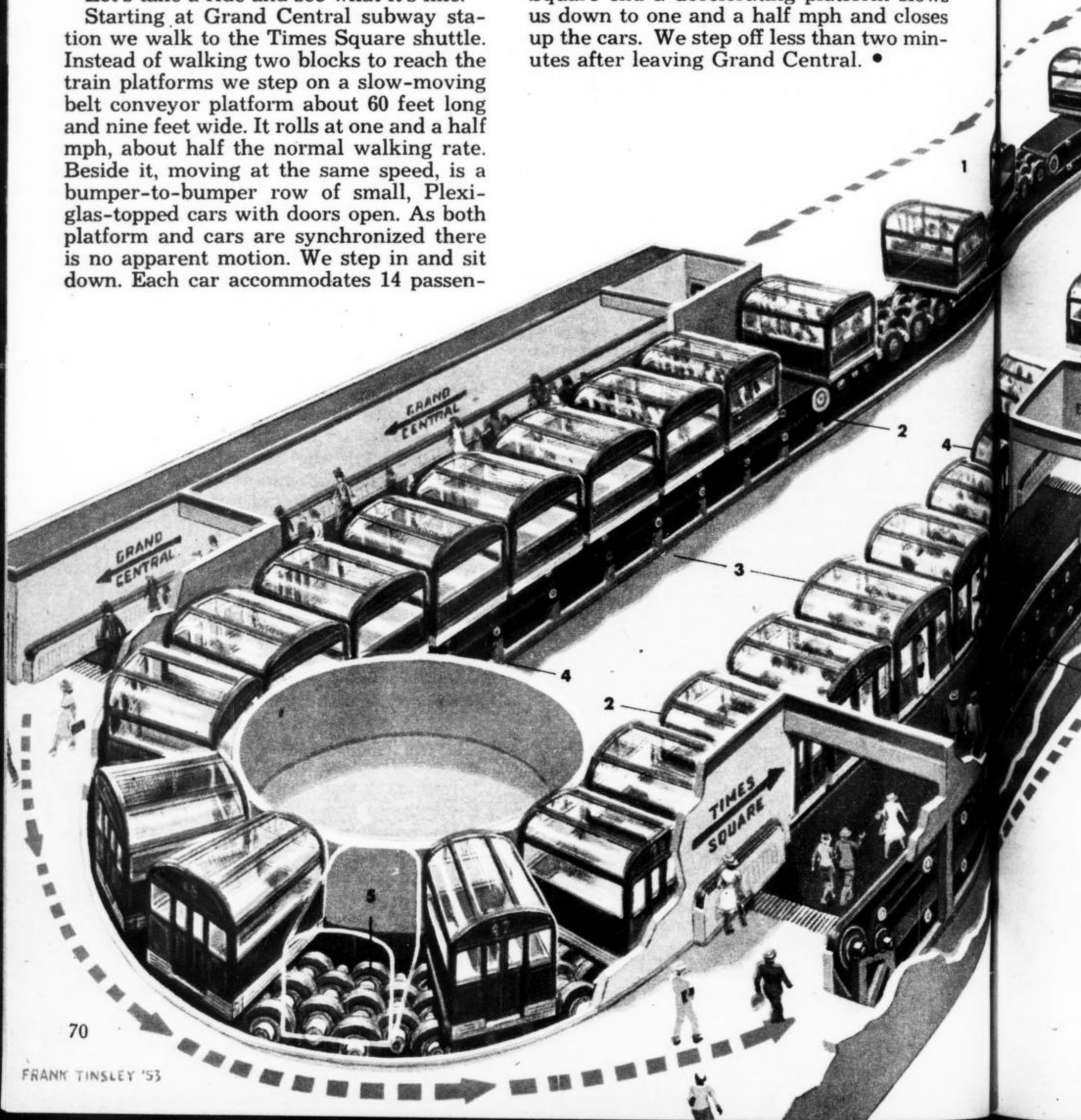
Sidney Bingham, chairman of the Board of Transportation in New York City, would, so he and a group of engineers devised the following plan estimated at \$3,800,000, which is \$1,700,000 less than the cost to modernize the present system.

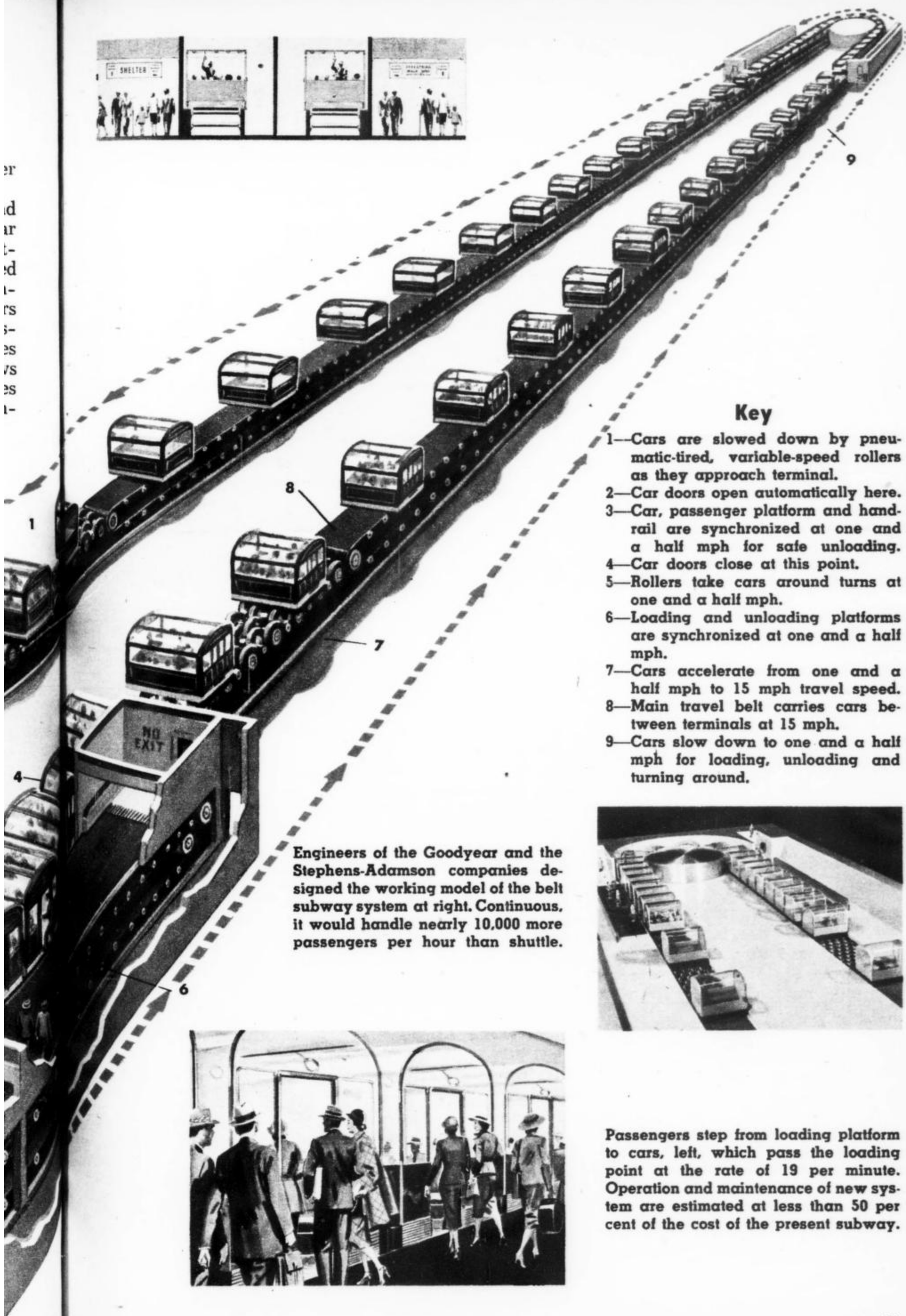
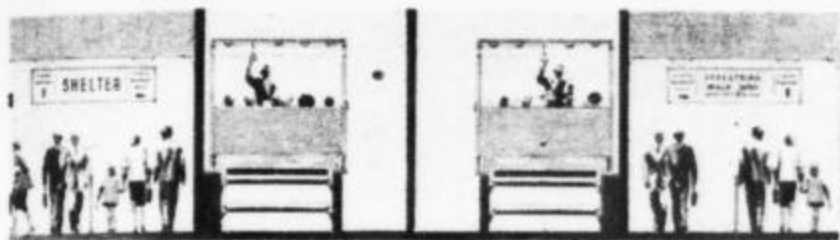
Let's take a ride and see what it's like.

Starting at Grand Central subway station we walk to the Times Square shuttle. Instead of walking two blocks to reach the train platforms we step on a slow-moving belt conveyor platform about 60 feet long and nine feet wide. It rolls at one and a half mph, about half the normal walking rate. Beside it, moving at the same speed, is a bumper-to-bumper row of small, Plexi-glas-topped cars with doors open. As both platform and cars are synchronized there is no apparent motion. We step in and sit down. Each car accommodates 14 passen-

gers. A maximum of 16,000 passengers per hour can be carried in each direction.

The doors close automatically at the end of the passenger platform and our car passes from the loading belt to a 33-foot-long bank of pneumatic-tired accelerated wheels. They are power-driven and increase speed to 15 mph, spacing the cars several widths apart for the 1,800-foot distance between terminals. At the Times Square end a decelerating platform slows us down to one and a half mph and closes up the cars. We step off less than two minutes after leaving Grand Central. •

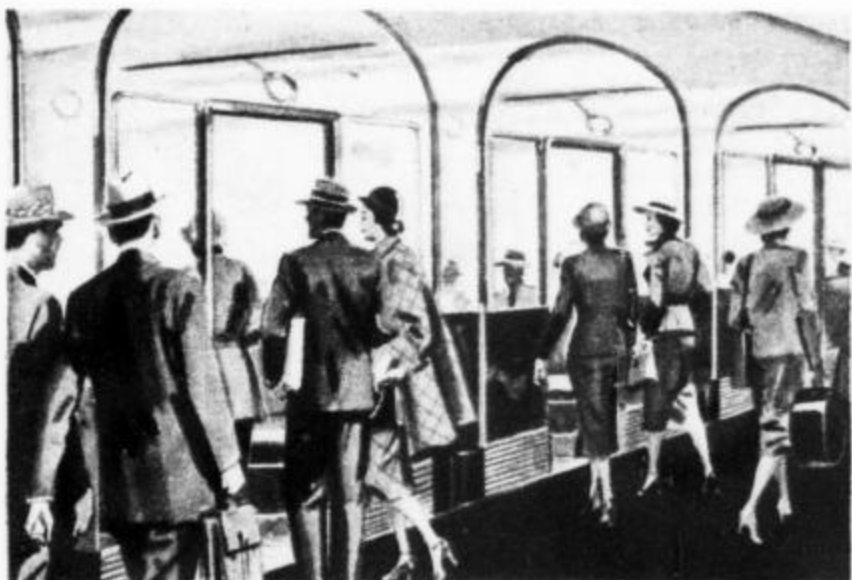
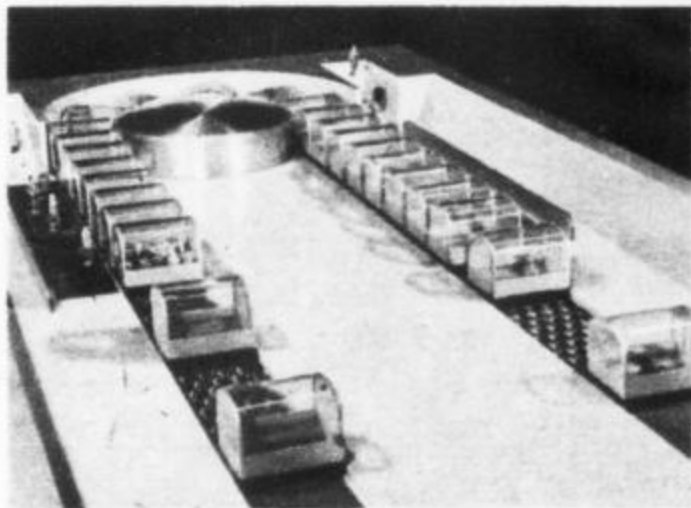




Engineers of the Goodyear and the Stephens-Adamson companies designed the working model of the belt subway system at right. Continuous, it would handle nearly 10,000 more passengers per hour than shuttle.

Key

- 1—Cars are slowed down by pneumatic-tired, variable-speed rollers as they approach terminal.
- 2—Car doors open automatically here.
- 3—Car, passenger platform and hand-rail are synchronized at one and a half mph for safe unloading.
- 4—Car doors close at this point.
- 5—Rollers take cars around turns at one and a half mph.
- 6—Loading and unloading platforms are synchronized at one and a half mph.
- 7—Cars accelerate from one and a half mph to 15 mph travel speed.
- 8—Main travel belt carries cars between terminals at 15 mph.
- 9—Cars slow down to one and a half mph for loading, unloading and turning around.



Passengers step from loading platform to cars, left, which pass the loading point at the rate of 19 per minute. Operation and maintenance of new system are estimated at less than 50 per cent of the cost of the present subway.

STORAGE COLLECTION

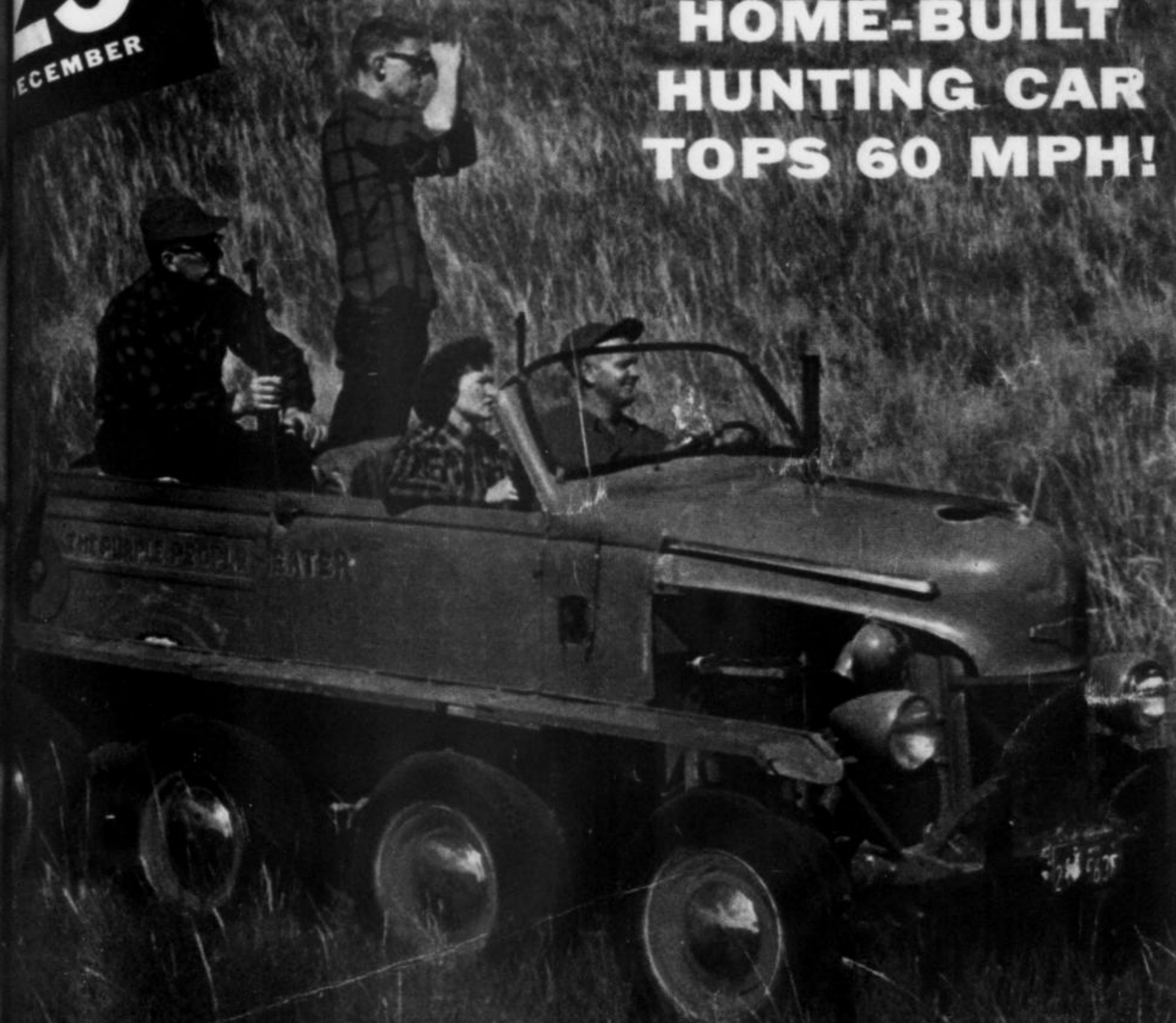
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DECEMBER 1961

Volume 57, Number 12

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COMING NEXT MONTH!



NEW PRODUCTS and new ideas provide the excitement in the January issue of MI—products ranging from that novel exerciser being demonstrated by MIMI (above) to a startling new 12-cylinder car engine; ideas from America's newest million-dollar invention to a kids' game you can devise with an old deck of playing cards. **PLUS**, of course, Uncle Tom's famous car tests! All in next month's MI, on your local newsstand December 21.

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**NEW
EQUIPMENT
FOR
TOMORROW'S
BRUSH-WAR
SOLDIERS**

By Frank Tinsley

WARRIORS of superhuman strength may soon make the feats of Achilles and Ajax and other legendary strong men look somewhat anemic. The Cornell Aeronautical Laboratories, under an Air Force contract, are developing a Strong Boy suit for servicemen that will enable them to pick up the front end of a car or shove a 1,500-pound load uphill like a human bulldozer. This may sound like

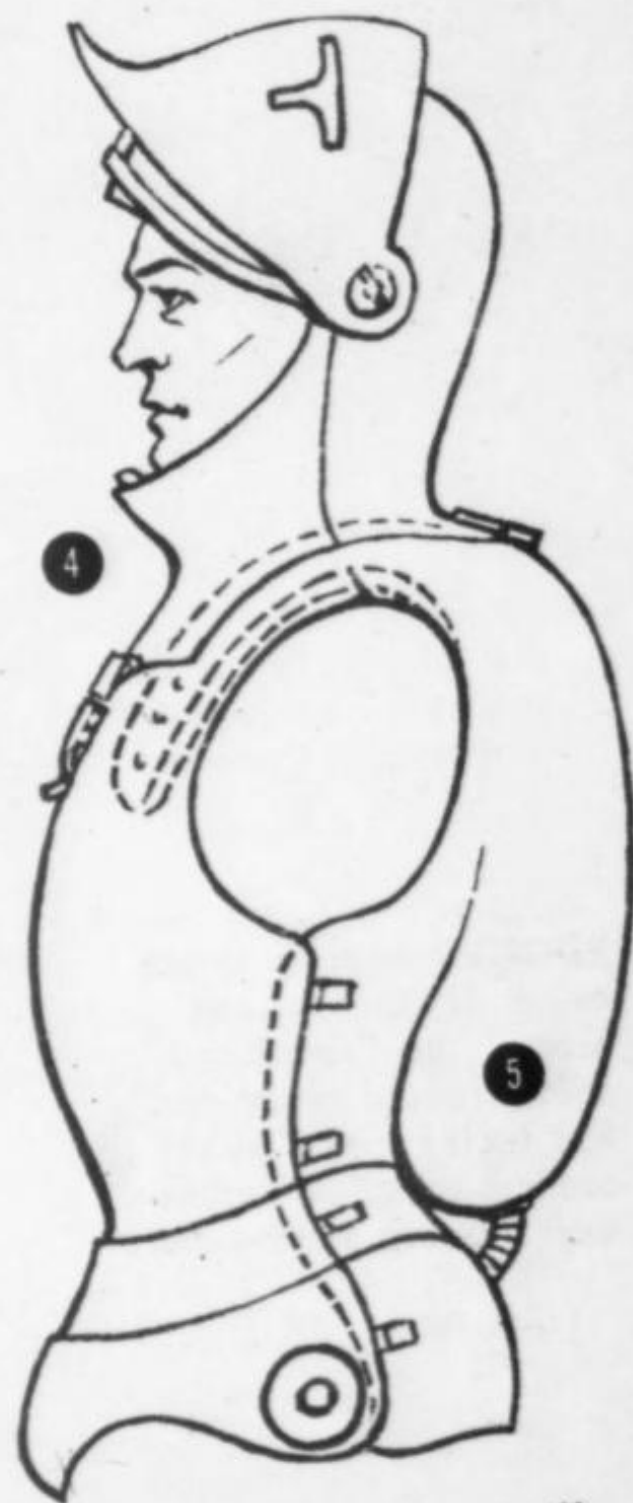
a crazy idea—but the Pentagon professionals who took almost a year to approve the project don't think so. It was in January 1961 that the Pentagon first saw the Cornell proposal for such a rig. What the Cornell boys are shooting for is called the servo-soldier—a human being fitted with external steel “bones” and a system of power-driven muscles that respond to and amplify his natural movements. If, for example, his normal wrist-twist develops a force of 96 inch-pounds, his amplified twist will be up around 5,000 inch-pounds. If his sideways shove is 54 pounds, his amplified shove will be half a ton. This enormous increase in physical power is obviously more than Charles Atlas can give him. It all comes from a rugged outer frame with joints operated by electricity from a power-pack on his back.

As I first saw this device in the publicity drawing released by Cornell, the power skeleton was a system of rods attached to the man's limbs by broad bands of metal. A sort of cuirass enclosed his trunk and on his head was a conventional GI helmet. It was obvious that the designers had not thought of making the soldier's steel bones serve as protection as well as stiffening to take tremendous loads under which human bones would snap like uncooked spaghetti.

The idea did occur to me, however. I did not at first think of that tiny giant, the ant, whose armor is also his skeleton, nor of all the other exoskeletal creatures whose strength is so amazing in relation to their size. What made me think of armor was a memory of my old job as the youngest dollar-a-year man in

HOW WE'LL GIVE ONE MAN THE STRENGTH OF TEN!

GENERAL VIEW of “man amplifier” shows soldier armed with submachine gun (1) with extra clips carried in waist rack. Steel visor raises (2) for upward vision or lowers (3) for protection. Profile view (4) of upper armor shows overlapping breastplate and backplate which contains fuel cell (5) for power.



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World War I. My career as a designer started in the Armor Section of the Army Ordnance Department. Our job was to develop helmets and body armor for both trench and mobile warfare. One of our principal problems was that a soldier could only carry so much armor and still function. Rifleproof armor for stationary sentinels and machine gunners in key positions was not impractical and the Germans did use such armor. But as the static stage of

the war gave way to more mobile tactics the armor was abandoned.

Naturally my thoughts turned to how much armor the new Cornell soldier might be able to carry and I concluded that the sensible thing would be to emulate the ants and have the bones serve as armor as well.

Equipped thus, the servo-soldier becomes a human tank who can wade through heavy fire implacably, spearheading attacks, repairing facilities in



POWERED external skeletons would enable GIs to perform great feats of strength. Here, an armored vehicle is lifted off a raft by crew of "powered" men.

RUGGED enough to act as a living missile mount, the "amplified" soldier could carry and fire extremely heavy tactical missiles, including A-bomb warheads.



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TOMORROW'S paratrooper is equipped with powered armor and jump belt. He descends by parachute, then releases harness and uses belt to make an on-the-spot landing.

full view of the enemy, etc. He can be airborne, he can ride or drive ground vehicles, he can wear a rocket jump belt to clear streams, swamps, barbed wire, street barricades, buildings. His potential for special operations is obvious.

In the accompanying designs I have tried to show what the armored "amplified man" might look like. The com-

plete armor weighs about 125 pounds—an insignificant burden to this man-sized Goliath. The power pack is in the double-walled backplate. The manned robot carries a sawed-off version of the new king-sized T-161 machine gun, which he can fire with one amplified hand. This gun is slung from his right thigh and [Continued on page 146]

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TECHNOLOGY

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GAS TURBINE PLANE
Geoffrey Smith's plane of
the future, based on his
work in jet propulsion

SPECIAL COLOR SECTION

PLANTS AND ANIMALS MADE TO ORDER

MECHANIX ILLUSTRATED

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MARCH, 1945

VOL. XXXIII NO. 5

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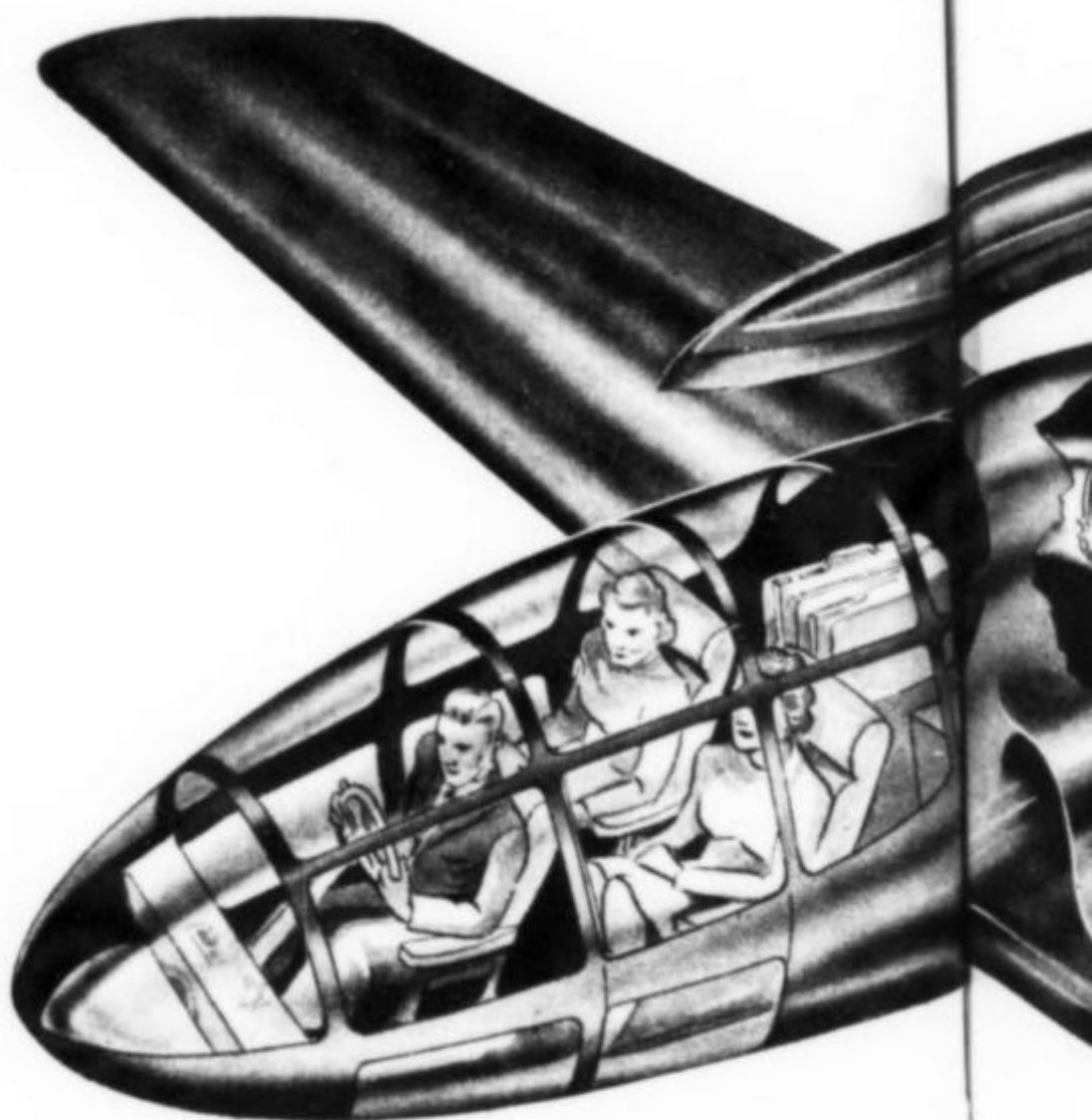
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JET PROPULSION IS NOT THE

"Turbine-powered propeller plane is more practical for low and medium altitude flying," says leading authority on gas turbines.

IN MY considered view, the prominence accorded to jet propulsion for aircraft in recent months has tended to obscure other important possibilities for the motive unit which produces the jet. More significant than propulsion by jet reaction is the successful development of the relatively small and simple gas turbine-compressor unit which can be readily adapted to generate continuous mechanical power. Jet propulsion, simple though it may be, is relatively inefficient under normal conditions and has distinct limitations in many fields of engineering. It is ideal for high speed, high altitude interceptor-fighter aircraft for example. But the new alternative to the reciprocating four-stroke engine whose preeminence is now severely threatened, is the gas turbine, which can and indeed does form a very attractive method of producing mechanical energy at the shaft. By taking shaft power from such a unit either by means of electrical, hydromatic or ordinary gearing, we should arrive at a form of prime mover possessing many irre-

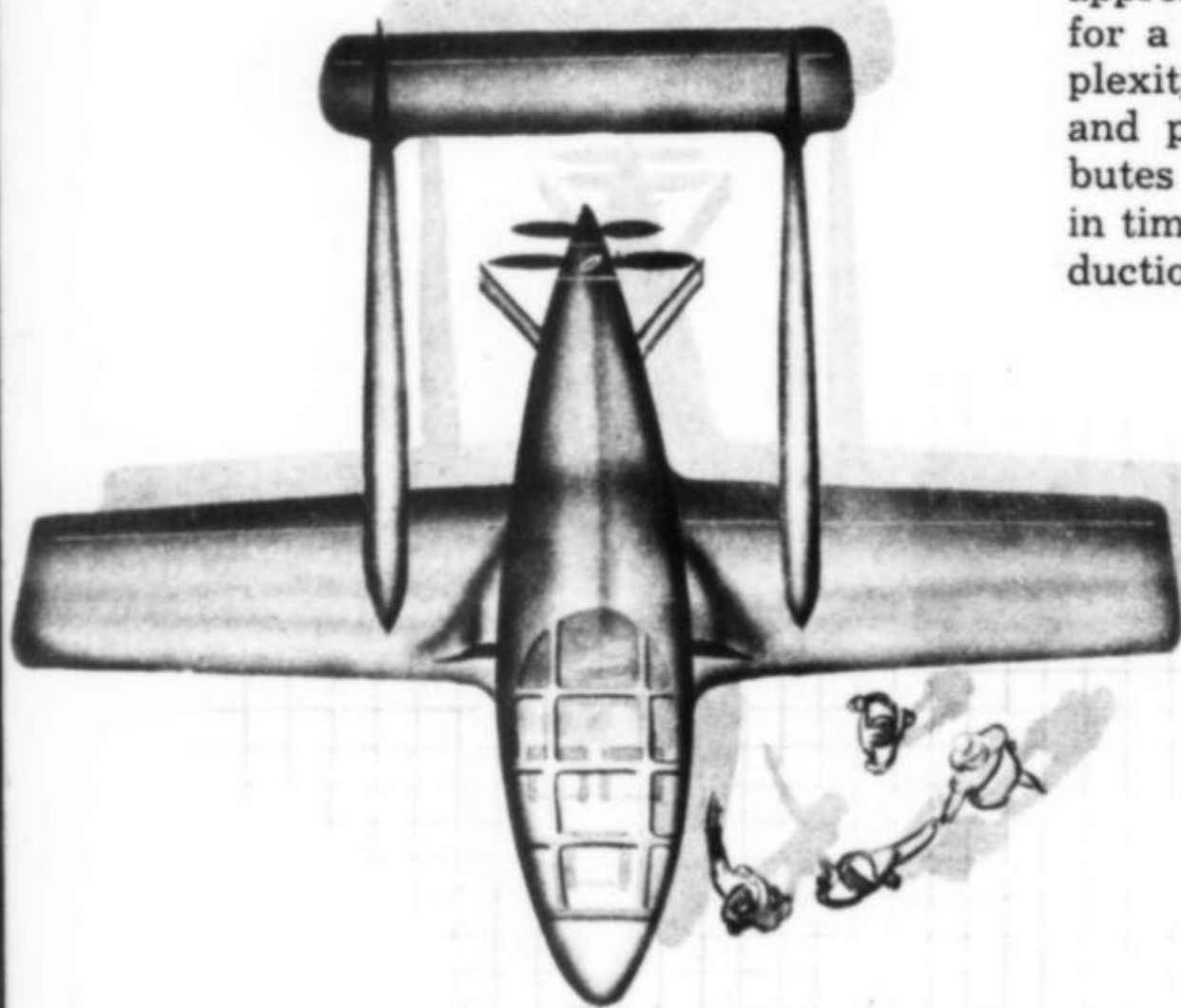


sistible claims for consideration. Since it is approximately half the weight, half the size for a given power, possesses half the complexity of the orthodox four-stroke engine, and produces continuous power, the attributes of the gas turbine are such that it will in time revolutionize all forms of power production. As to smoothness of operation, rotative engines are far more easily—almost naturally—balanced, which is a further great advantage. Noise, too, is greatly reduced.

The normal four-stroke engine by comparison necessitates complicated methods and meticulous care in production to ensure good balance and smooth operation. Such reciprocating engines

Ideal postwar family plane will be turbine twin-propeller pusher.

Mechanix Illustrated



ANSWER

by G. Geoffrey Smith, M.B.E.

author of *Gas Turbines And Jet Propulsion For Aircraft*, Directing Editor of *Flight and Aircraft Production*.



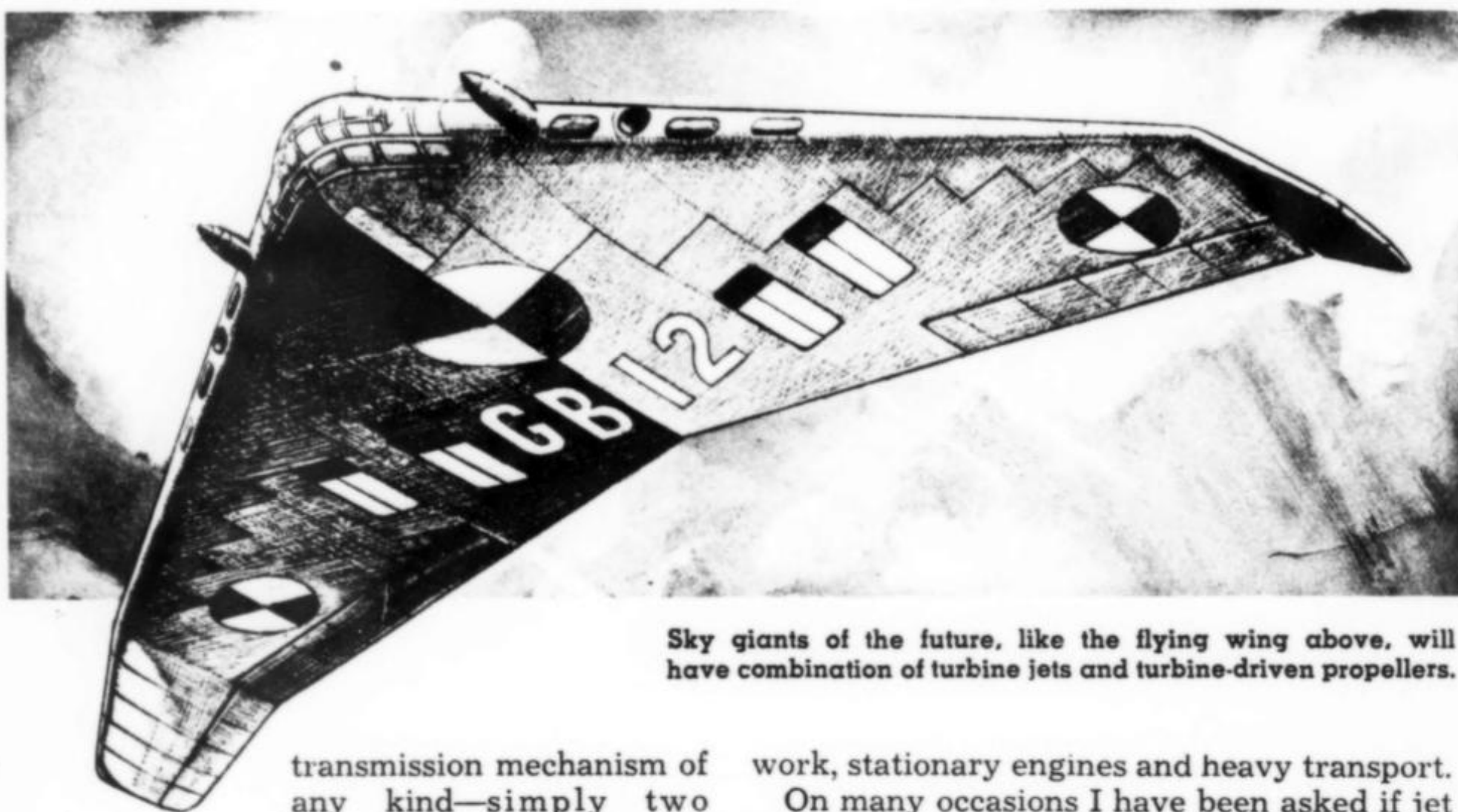
This turbine plane with contra-rotating props, envisioned by author, will be economical, efficient and high-speed.

by their nature involve a reversal of direction of the pistons four times in each complete operational cycle. As the term "four stroke" implies, there is but one power stroke in the four operational strokes of the cycle and two revolutions of the crank shaft. Intermittent explosions do not contribute to perfect balance, nor does the process of transforming reciprocating action to rotary action by means of a piston rod and crank shaft. Consider now the turbine-compressor unit which operates on a continuous cycle—i.e. there are no separate explosions. There is a complete absence of gearing or

March, 1945



Geoffrey Smith, right, exchanging notes with Willy Ley, rocket expert who is no stranger to MI readers. Mr. Smith has been in this country for several months, is returning to London shortly. Things have been happening to Mr. Ley. Publication of his latest book, *Rockets*, brought a transcontinental call from an old friend. Result: he's in Georgia now, manufacturing meteorological instrument-bearing rockets. They'll make postwar news.



Sky giants of the future, like the flying wing above, will have combination of turbine jets and turbine-driven propellers.

transmission mechanism of any kind—simply two rapidly rotating circular components mounted on a single shaft. The more one studies the claims of the turbine the more one becomes convinced of its future.

After all, what Air Commodore Frank Whittle achieved when his first engine unit passed successful trials in 1937 has a parallel in steam engineering. For a great many years the reciprocating steam engine held sway until the introduction in 1884 by the late Sir Charles Parsons of the steam turbine. His object was the same as Whittle's, to substitute rotary for reciprocating motion, and the effect was to revolutionize power production by steam. Young Whittle, who took out his first patent in 1930 when only 22 years of age, bids fair to achieve a similar transformation in piston engines with his gas turbine.

We advocates of gas turbines impatiently await the outcome of the painstaking work of metallurgists to evolve metals or, rather, alloys of great heat resisting qualities, metals that will not scale or corrode under the terrific heat generated at the turbine entrance. Temperatures of over 1000° F. are involved. Already great success has been achieved on both sides of the Atlantic, but as new and improved metals are evolved, the efficiency will go up and the gas turbine given another stimulus which will undoubtedly give this form of rotative power all conquering sway. Not only is the gas turbine destined for aircraft, its influence will be, indeed already is being felt in other spheres of engineering which I would place in the following probable order of priority: locomotives, marine

work, stationary engines and heavy transport.

On many occasions I have been asked if jet propulsion is suitable for cars. Since the jet issues from the tail nozzle in the form of a hot blast and of a velocity sufficient to sweep a man off his balance at twenty feet range, the answer is simple. Even the wearing of asbestos pants or stockings would not rid us of danger! Adapted for mechanical shaft power, the turbine for road vehicles is a definite consideration of the future.

Today the difficulty is to build a turbine down to low powers. It is easier to plan and develop a big unit which is in itself an impressive fact as the large 100-ton passenger aircraft projected for the immediate future will need—do need now—5,000 to 10,000 h.p. engines. No new four-stroke aircraft engine of renown has been fully developed and proved in a period under five years, and this record is not likely to be beaten with present knowledge. Consider the turbine again and the fact emerges that a unit of such size could be manufactured and proved in a quarter the time. It is frequently overlooked that in an orthodox engine the functions of induction, compression, firing and exhaust, take place in the same organ, the cylinder, which is a handicap. On the other hand, in the gas turbine separate components are utilized for the different operations so that the design may be more efficiently planned.

By and large the future of the gas turbine either in its simplest form or with multi stages, is a rosy one. Its great potentialities even today can only be visualized.

It is well, therefore, to allay the impression that "jet propulsion" is the significant discovery. The gas [Continued on page 66]

Vergeltungswaffe 2

Can New York be bombed by rockets? Here are the latest and most complete facts on these dread Nazi missiles, which may bring the war to America's shores.

by

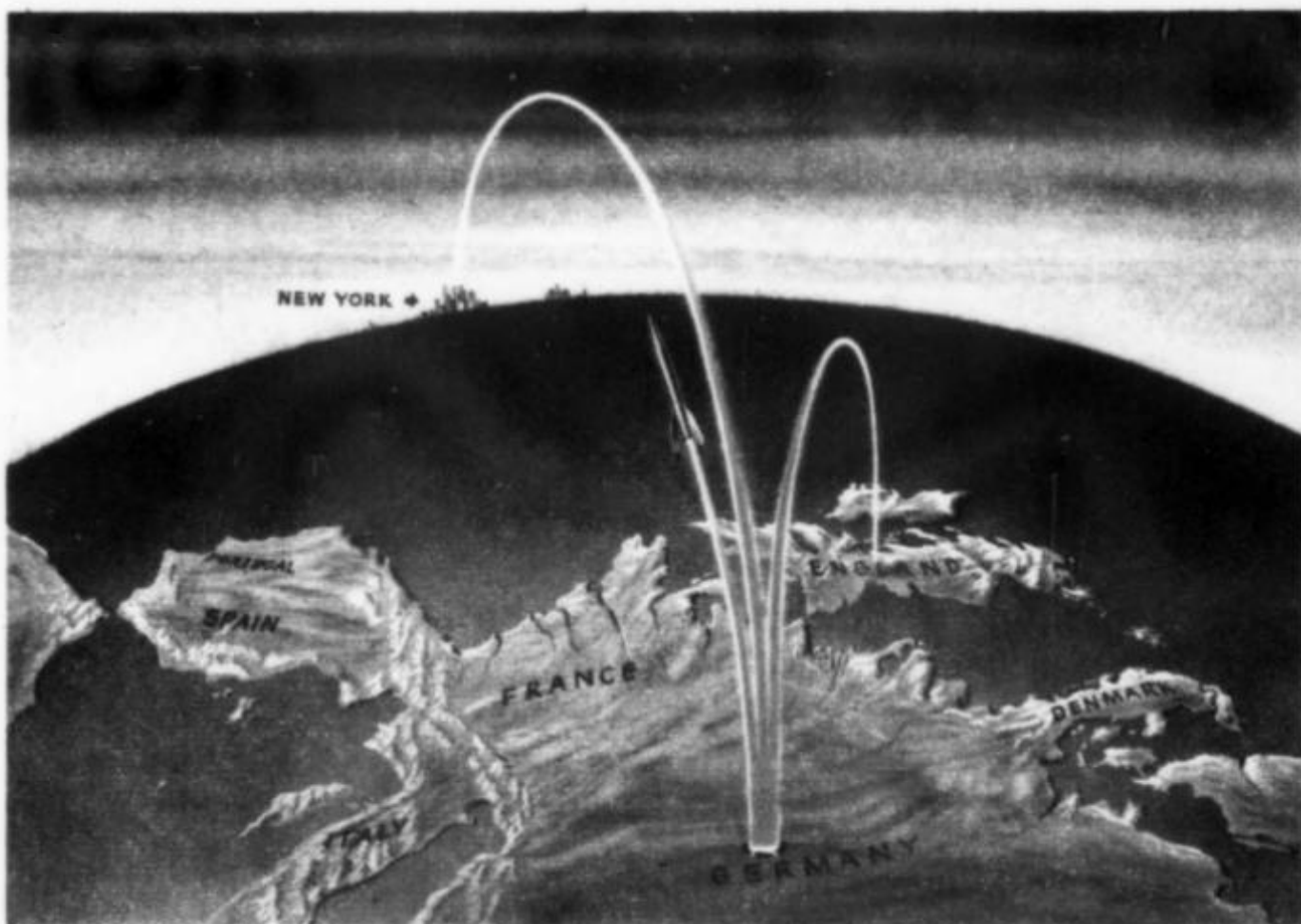
Martin Caidin

THE skies over the northeastern United States are clear tonight. A shooting star distinguished from the other heavenly bodies by its brighter flame hurtles downward. But this meteorite does not fade out. It races toward earth, trailing long streaks of red and yellow flame. *This is no shooting star.* It is a long rocket-like tube with a scarlet ball of flame at its tail, swinging downward at an acute angle toward the horizon. Within a few seconds it vanishes into the shadows of New York's skyscrapers. A tremendous explosion rocks the earth; the searing flames and blast air diminish as a flickering red glow is reflected in the sky. V.3 has struck at America.

That is what might happen—now—to New York, or Boston, or Philadelphia. That is what is happening—now—to British, Belgian and French cities. The giant V.2 stratosphere rocket, launched from its hidden bases and piercing the stratosphere at several times

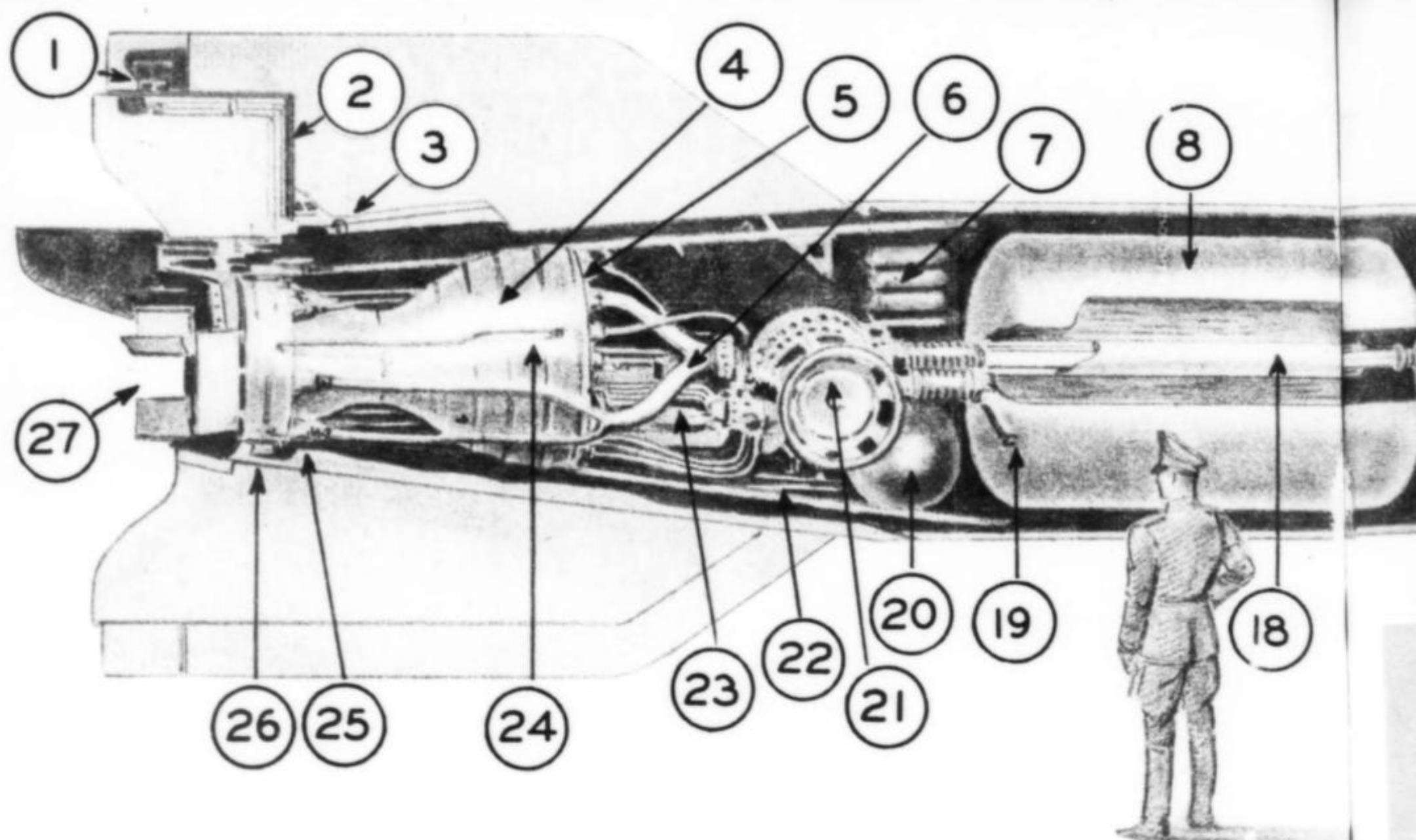
the speed of sound, is a weapon capable of wreaking havoc on the most powerful structures. We are actually witnessing one method of destruction that might ravage the world in a third World War.

V.2 is the latest nemesis of Great Britain. Perhaps V.3 will be America's first. A development of the deadly V.2, V.3, Germany's third reprisal or vengeance weapon, is far more dangerous and accurate. According to information received from German prisoners of war captured in the intricate defense system of Metz, V.3 is a 14-ton projectile with



Martin Caidin is something of a boy wonder in aviation journalism. A ripe old 17 now, he was launched on his career 16 months ago as an office boy for Air News and Air Tech. Today he's an associate editor of both magazines, the youngest member ever to be admitted to the Aviation Writers' Association, with several scoops to his credit. Martin is an avid reader of science fiction, haunts roller-skating rinks, plans to study history and journalism in night school, devotes much of his time to "gorgeous number, name (censored)."





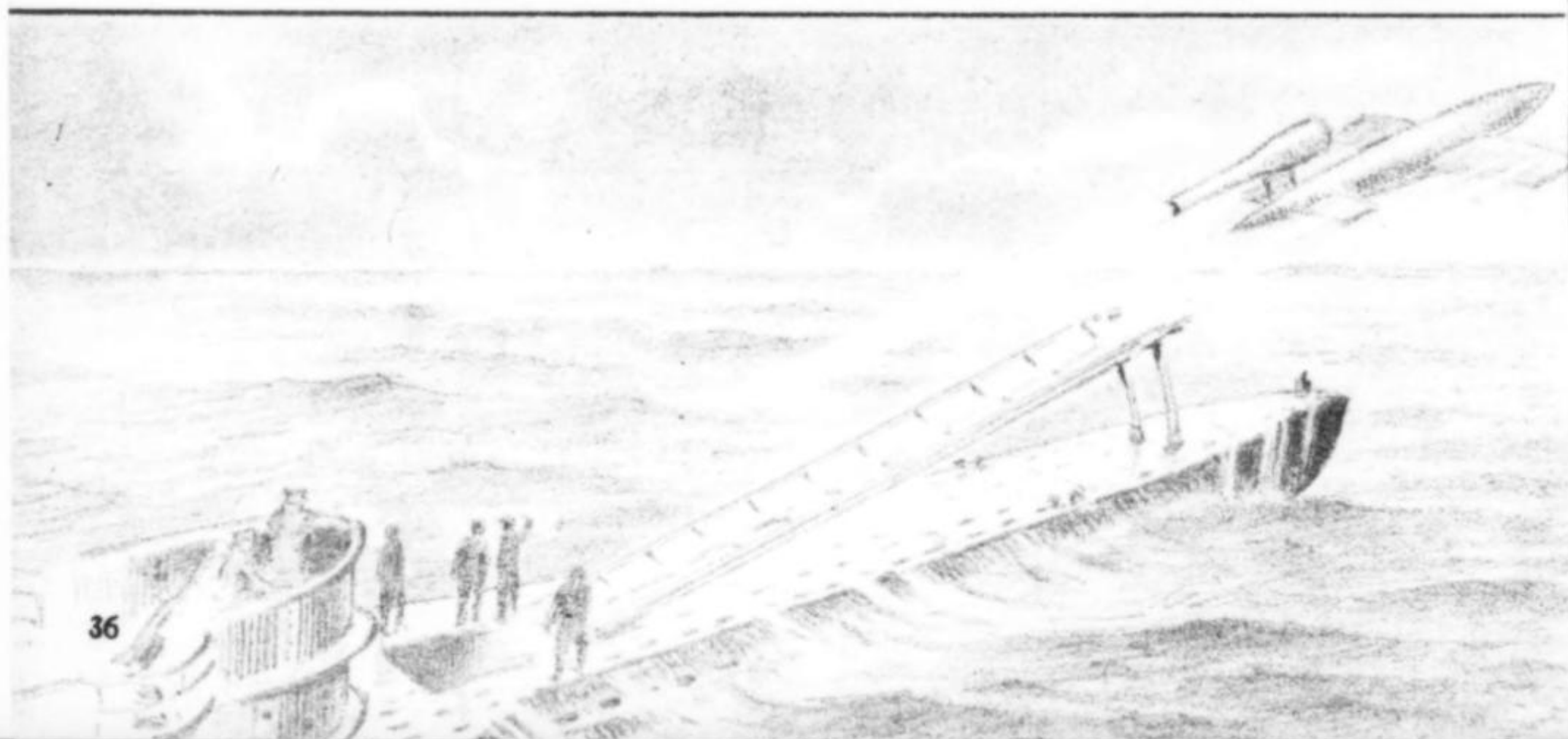
a two-mile circular range within which a killing effect is produced, indicating that it carries a much greater weight of explosives than V.2. Propelled by the same fuel, a mixture of liquid-air and alcohol (a wicked combination), it is hurled into the air vertically and controlled by radio. The effective range of the missile is not now known, but estimates from fairly reliable sources have ranged as high as 3,500 miles and more, making possible attacks upon American shores.

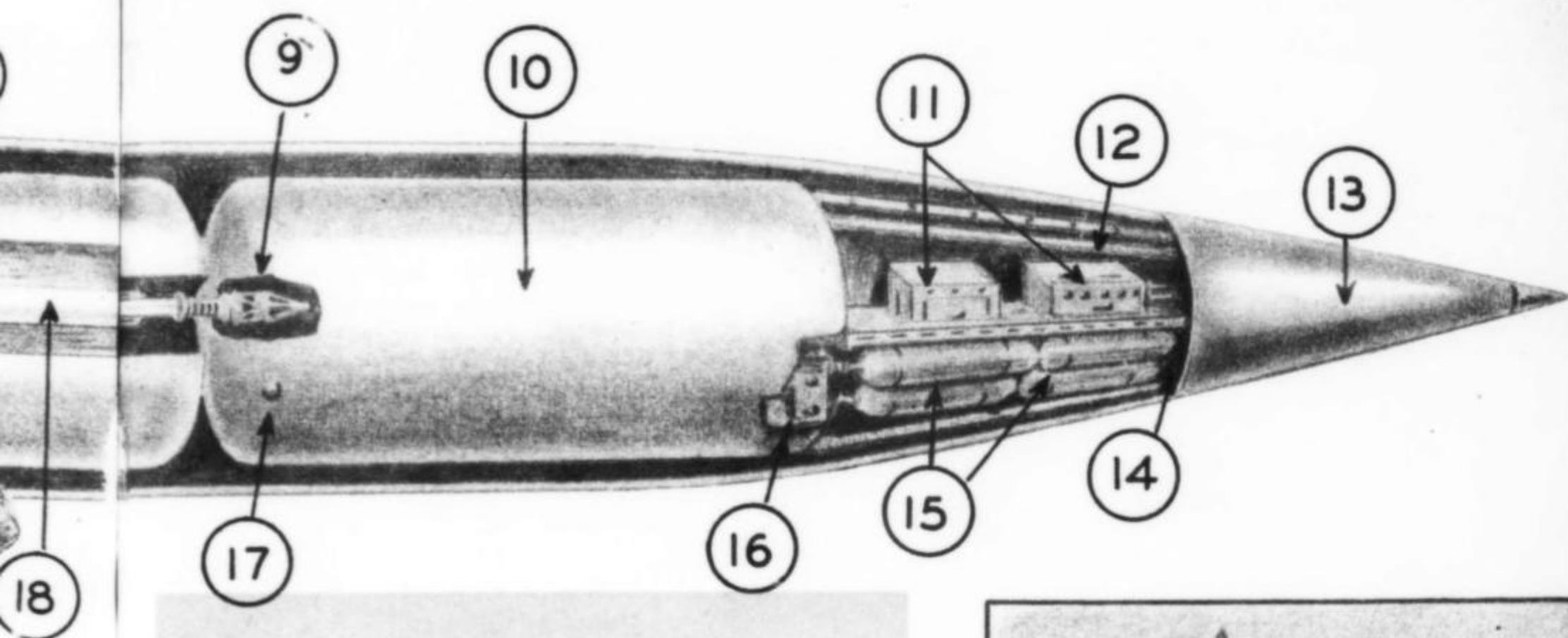
The most likely targets are New York and Boston, because Washington is some 3,800

miles from London. The dimensions, as reported by German prisoners, are: length, 58 feet; diameter, 5 feet. Before the start of their fanatical resistance against the American armies, the defenders of Metz were promised that if they held out until September 30, 1944, V.3 would be brought into action and would change the entire course of the war. It is too early to say that it is impossible to fulfill the promise completely. V.3 remains a dagger aimed at the heart of New York.

V.4, like V.3, has not yet been seen in action, and less is known about it than about V.3.

Drawing below is an artist's sketch of how a V.1 robot bomb might be launched from the deck of a submarine against a target on the American coast. The bomb would be carried, dismantled, within the sub. The ramp could be folded flat on the deck when not in use, set up when needed.



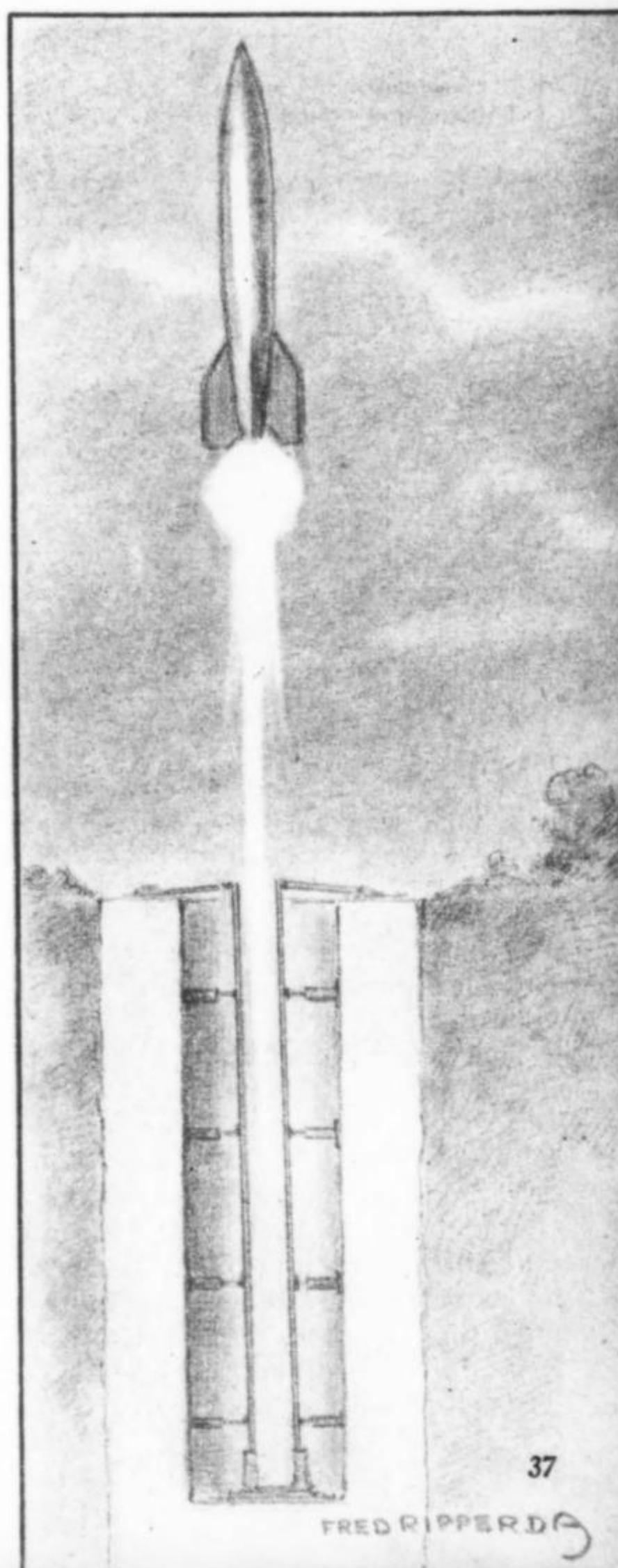


Diagrammatic cross section of the V.2 rocket bomb shows: 1.4 external control vanes; 2. Chain drive to external control vanes; 3. Electric motor; 4. Combustion chamber and venturi; 5. Burner cups; 6. Alcohol supply from pump; 7. Air bottles; 8. Liquid oxygen tank; 9. Servo-operated alcohol outlet valve; 10. Alcohol tank; 11. Radio equipment; 12. Pipe leading from alcohol tank to warhead; 13. Warhead; 14. Electric fuse for warhead; 15. Nitrogen bottles; 16. Pitch and azimuth gyros; 17. Alcohol filling point; 18. Double walled alcohol delivery pipe to pump; 19. Oxygen filling point; 20. Hydrogen peroxide tank; 21. Turbine and pump assembly; 22. Permanganate tank (gas generator unit behind); 23. Oxygen distributor from pump; 24. Alcohol pipes for subsidiary cooling; 25. Alcohol inlet to double wall; 26. Electro-hydraulic servo motors; 27. 4 internal control vanes (behind tail).

It is reported to be patterned after V.2, and there is reason to believe that the detonative force is derived from atomic power.

On November 10, 1944, Winston Churchill announced that Germany had been bombarding England proper for several weeks with a powerful stratosphere rocket bomb. Announced by the German High Command as the *Vergeltungswaffe II*, the rocket was truly an awesome weapon against which there was no defense beyond capture or destruction of the launching sites. Mr. Churchill announced that the rocket tore into its target at super-sonic velocity (well above sound), allowing no warning to the population. It would penetrate its objective with greater depth destruction than

Artist's sketch of the probable method of launching a V.2 rocket bomb from a concrete-lined pit sunk deep in the ground. Angle of launching rails, which aim bomb, may be changed by adjusting supporting hydraulic jacks.



AVIATION • INVENTIONS • HOBBIES

MECHANIX

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3RD ANNUAL CONTEST
See Page 66



MECHANIX ILLUSTRATED

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SPECIAL FEATURES

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Noted astronomer, Assistant Curator of the Hayden Planetarium

NEXT MONTH!

He was a member of the Czechoslovak Air Force when Hitler occupied that country in 1939, and as such he was immediately imprisoned by the Nazis. But he escaped. He went to France, joined the Foreign Legion, and fought the Germans in the Low Countries and France in 1940. After Dunkirk he slipped past the Nazis again, and went to England. And now he's the most famous individual pilot in the R.A.F., with 31 Axis planes to his credit, most of them brought down at night! Who is he? He's Karel Kuttelwascher, R.A.F., Czechoslovak Military Cross and Medal for Gallantry, Croix de Guerre three times, Distinguished Flying Cross with bar. How does he do it? He'll tell you himself, in the March issue of MECHANIX ILLUSTRATED. DON'T MISS IT!



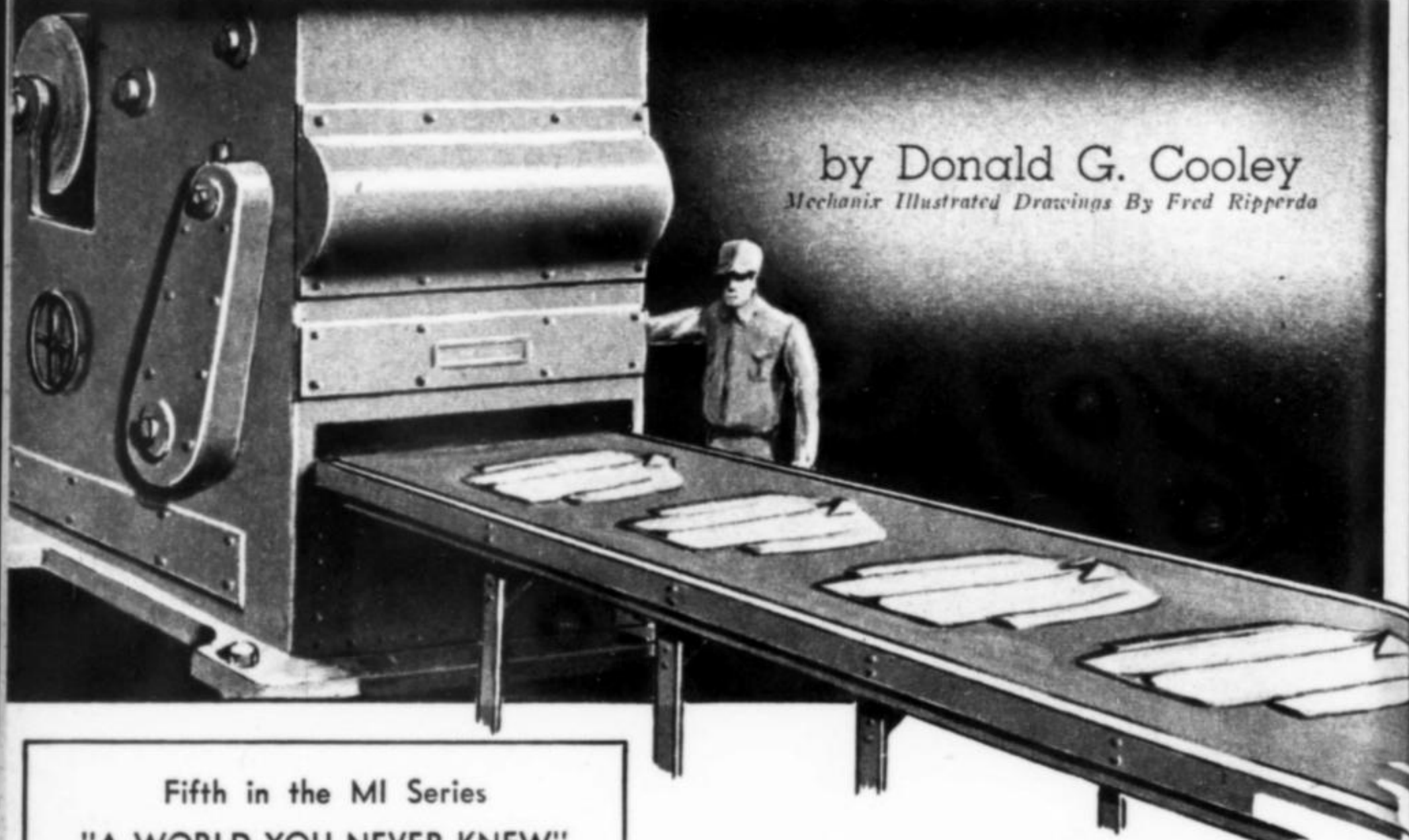
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MEMBER AUDIT BUREAU OF CIRCULATIONS

HOW YOUR DAILY LIFE WILL BE CHANGED

by Donald G. Cooley

Mechanix Illustrated Drawings By Fred Ripperda



Fifth in the MI Series
"A WORLD YOU NEVER KNEW"

Above: Your shirts will be stamped out of paper-like material after the war. You can wear them once and toss them away.

LET'S dress you from skin to topcoat, to dramatize the coming clothing revolution. You break out your socks, underwear and shirt from factory-fresh packages. When you undress tonight you'll toss them aside like disposable tissues. The laundryman is practically out of business, for it's cheaper to have a standing order of new garments delivered every week or two than to have the old ones washed and ironed.

As you slip into your underwear and shirt you marvel at their form-fitting comfort. They *ought* to be comfortable, for they are moulded to the contours of the body and there is not a single seam, ridge, button or buttonhole. No wonder your shirts are throwaway-cheap: there's no hand labor of cutting to patterns, assembling, sewing, buttonholing. Rolls of fabric are fed into one end of a machine like a newspaper press, to emerge on a delivery belt at the other end at the rate of several hundred an hour.

Your shoes are muddy, but a damp rag removes every bit of dirt and leaves a perfect polish. The material isn't leather but a flexible, semi-porous plastic. You open the closet



The suit above looks and feels like worsted—but it's made out of Celanese, or spun rayon, only one of many new fabrics.

Mechanix Illustrated

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BE CHANGED AFTER THE WAR

door and wonder which of the half-dozen suits hanging there you will wear today. These suits aren't as cheap as your shirts; so you don't throw them away, but you can have four or five of them for what you used to pay for one worsted suit. The seams are fused, or "soldered" together, eliminating costly sewing. You choose a "wool" suit that isn't wool and notice an egg spot on the vest. Never mind dry cleaning—soap and water will remove dirt and grease spots, for the fabric is waterproofed by an invisible plastic that leaves it soft and cushiony. Not even a violent rainstorm can remove the crease from your trousers.

It is cold outdoors—snowing, in fact—so as you slip into your topcoat you place a gadget that looks like a fountain pen in an inconspicuous pocket. It is a tiny battery that connects with flexible wires woven into the coat, heating it electrically. Even if you don't care to turn on the juice your lightweight topcoat is still extremely warm, for it is insulated like the wall of a house filled with rock wool. Strings of cellophane, swollen with tiny beads no larger than a pinhead, are woven under the lining. Each bead is inflated with a bubble of air that

prevents your body heat from escaping.

Fantastic? Every one of these advances is on the way! Hundreds of Flying Fortress pilots are wearing electrically heated flying suits right now. The du Pont Company has perfected a process for stamping one-piece seamless gloves out of nylon. The air bubbles in cellophane are being manufactured



This (above) is "Bubbifill"—bubbles of air enclosed in cellulose. It is buoyant, extremely heat-insulating and is used in many manners.

The fine, thread-like material below is "Fiberglas," a new material spun out of pure glass and used for many new fabrics.



The producers of another new plastic, "Koro-seal," expect to make stockings that won't run.





This picture illustrates graphically the saving in shipping effected by dehydrating food and milk. The ship at right will carry as much milk, dehydrated, as 20 ships full of regular milk.

by the same company for use in military jackets and life rafts. The Germans are producing clothing with fused seams. Several new plastics can be incorporated into textiles for waterproofing, and at least one of them—Goodrich's Koroseal—can be woven into women's sheer hose to make stockings which will never run. And the revolution in clothes is only the beginning.

Strange-looking flakes and powders turn out to be meat, milk, eggs and vegetables from which the water has been ruthlessly removed.

Seedless tomatoes and watermelons have been produced by treating the plants with hormone solutions, and brand-new foods as yet unknown to man are heralded by the X-ray bombardment of seeds. You can eat a Christmas tree or the dining-room table by converting the wood into sugars.

Hay fever pollens in the homes are being snatched out of the air by electrical annihilators. Mineral atoms made radio-active by treatment in giant atom-smashers are acting like tracer bullets to reveal stubborn secrets

of how the body works. Patients are swallowing these radio-active atoms in the experimental treatment of certain diseases—in effect, they are “drinking” X-ray machines which work from within their bodies.

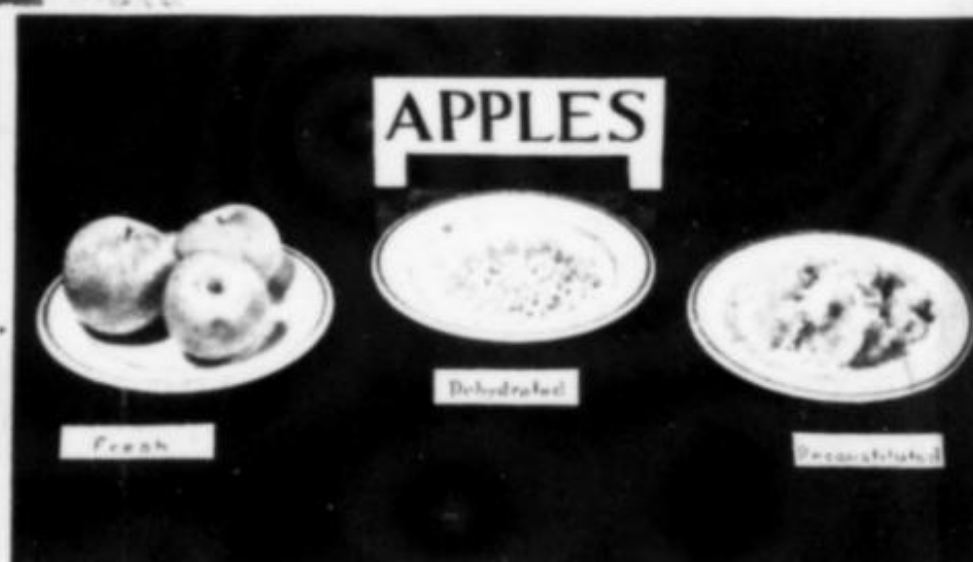
Let's take a look at the great food revolution that is already beginning to give our eating habits such a shaking-up as they have never dreamed of.

Just to show what can be done, we'll help you prepare breakfast without once opening your cold

Left: Troops in the field could not get vegetables until the invention of new food dehydrating processes. Now they get potatoes in cans!



This is how potatoes look dehydrated and reconstituted.



This is how apples look dehydrated and again reconstituted.



storage refrigerator. You like to start the day with orange juice? There are 2½ cases of oranges concentrated in that gallon jar on the shelf. Pour a little into a glass and dilute with water—all the vitamins are there and the stuff keeps for weeks without refrigeration.

Toast is made from a loaf of bread that has no crust. It is baked from inside out by electric currents. Bacon strips come from a package that has been on an open shelf for two months. There's no trace of rancidity. Laminated plastic wrappings keep the flavor in and prevent spoilage. If you prefer ham and eggs, you can dip them out of a can, plop into a frying pan and you have an appetizing omelet. Or you can take a spoonful of yellow powder out of a can marked "Eggs," mix with water and milk and serve as scrambled eggs. A container about the size of an ordinary can of peaches contains the equivalent of three dozen eggs.

Perhaps you like cereal for breakfast. Lift down a compressed cake the size of a candy bar, add hot or cold water as you choose, and your cereal is ready. Never mind the cream and sugar—they're included in the cake. Cream comes from a bottle on that same unrefrigerated shelf. It doesn't go sour, being a stabilized product that holds up indefinitely. Butter comes off the warm shelf too. It isn't

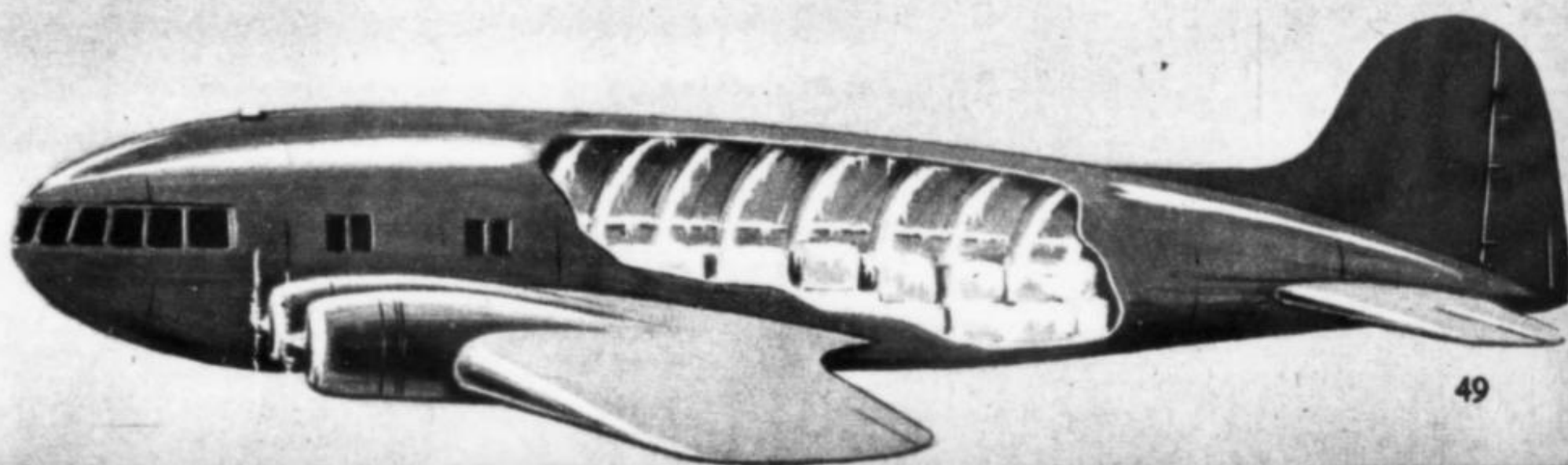
melted and it's not rancid, for it's "Army Spread" that remains solid at 120 degrees. Jam and preserves for your toast are poured out of a package in the shape of dark bone-dry pellets. Add water and they're ready to spread.

You'll want a breakfast drink too. Drop a lozenge reminiscent of a cough drop into a cup of hot water and you have tea. Coffee may not be coffee at all, but roasted wheat, rye, barley or other cereal. But it tastes exactly like coffee because a chemical known as furfuryl mercaptan has been added. Chemists have discovered that this is what gives coffee its characteristic flavor and aroma. If you want a stimulating jolt, it's no trick to incorporate caffeine in the beverage.

Many of these foods are already here, but the Army gets most of them right now. The Army Quartermasters Department at Chicago has developed scores of new food forms for military use. There is chili con carne in a roll like sausage. There are boneless frozen meats that require only one-third the storage space required by ordinary meat—a feature which will certainly appeal to the housewife after the war. There is a dark, flaky product which, twenty minutes after you add water and turn on the heat, can be served as hamburger, meat loaf or stew. Half a pound of it equals six pounds of lean steak. Hams can be preserved indefinitely regardless of temperature by spraying them with an impervious coating.

As for dehydrated foods of other varieties, you'll soon be using them if you aren't already. Your own grocer undoubtedly has the new dehydrated soup mixes on his shelves right now. Add water and heat and you'll have a fresh soup that came to you in a transparent envelope. Dehydrated carrots, white potatoes, cabbage, peppers, spinach, string beans, sweet potatoes and beets will soon be

Fruit and vegetables picked in the field can be whisked 30,000 feet aloft in cargo planes after the war and quick-frozen in the 60-below temperatures of the stratosphere, according to one plan.



TECHNOLOGY

MECHANIX ILLUSTRATED

A FAWCETT MAGAZINE

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INVASION by
U. S. Rangers
See page 46



HOW FIGHTER PLANES PROTECT BOMBERS

BY ARCH WHITHAM

CYCLES PREDICT 1945 BOOM 1947 DEPRESSION

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JUNE, 1944

VOL. XXXI NO. 8

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the American Museum of
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LT. COMDR. BOB BARTLETT

U. S. Navy

On the cover: Ducking 'em ashore—kodachrome by INP.

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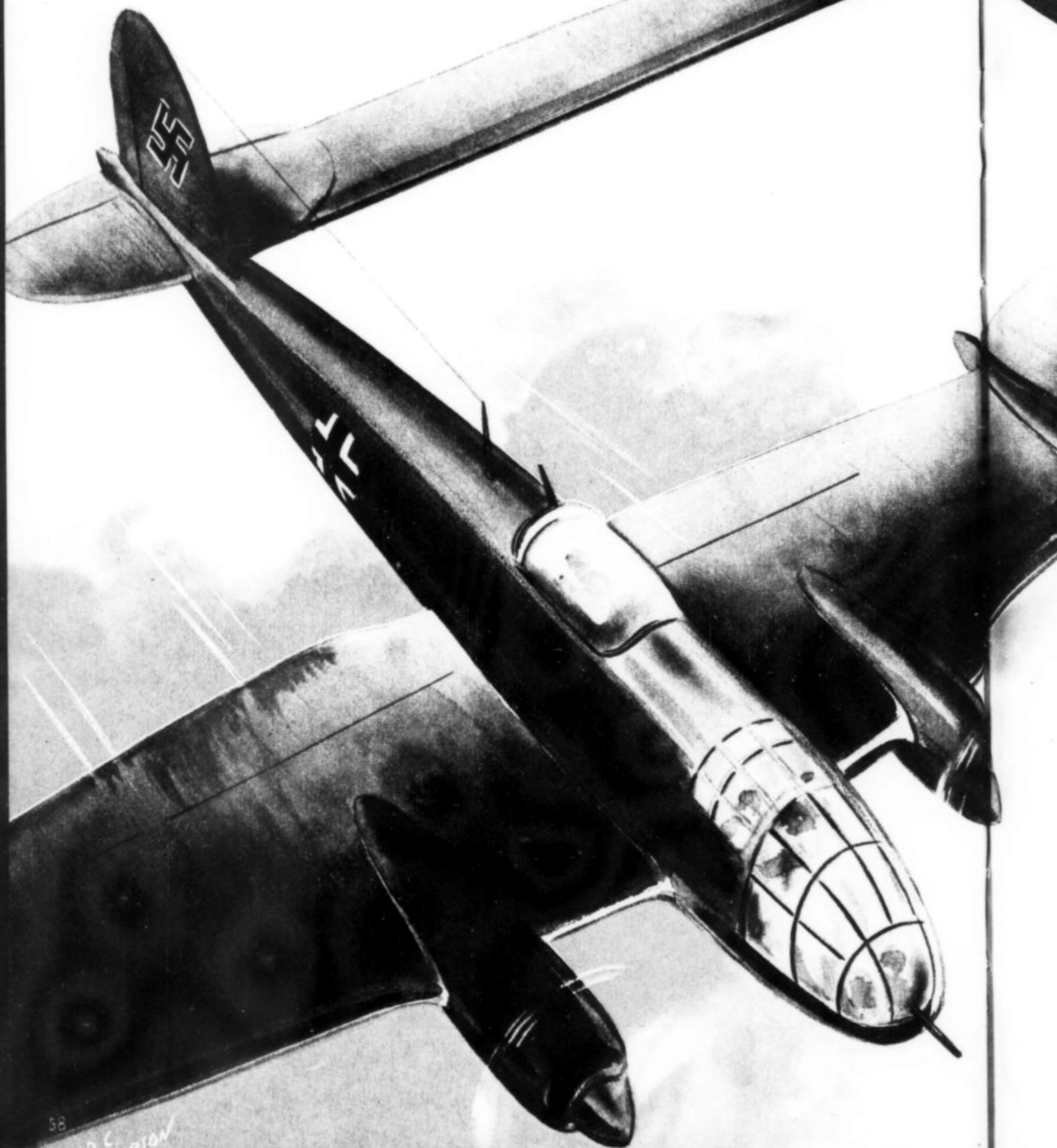
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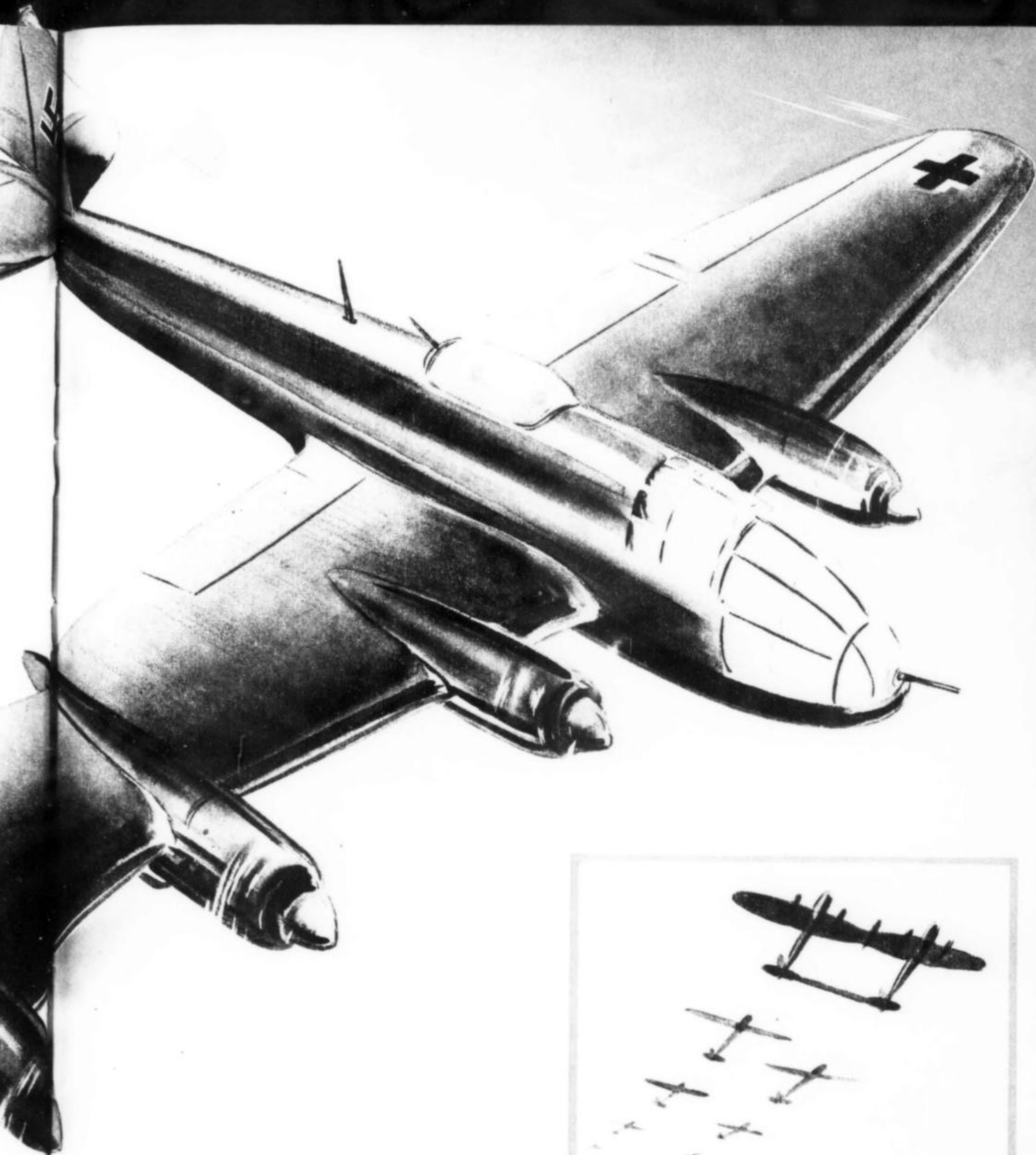
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MEMBER AUDIT BUREAU OF CIRCULATIONS

GOERING GARGOYLE



58
REYNOLD C.
ANDERSON



ONE afternoon last March an American airman saw a strange sight over France. It was an aerial Siamese Twin—two Heinkel 111's, twin-engined bombers, joined at their wing-tips, with a fifth engine mounted between them. He shot the gargoyle down, winged back to his base and reported. Intelligence officers figured out that the monster was not the German version of our fork-tailed P-38, but merely a glider tow-plane. Hitler's aviation industry must be in a bad way if it has to resort to such last-ditch makeshift devices.

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OLD CAR CONTEST
WINNERS ANNOUNCED!
SEE PAGE 96

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2D OLD AUTOMOBILE CONTEST. 96**

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VOLUME 48 NUMBER 6

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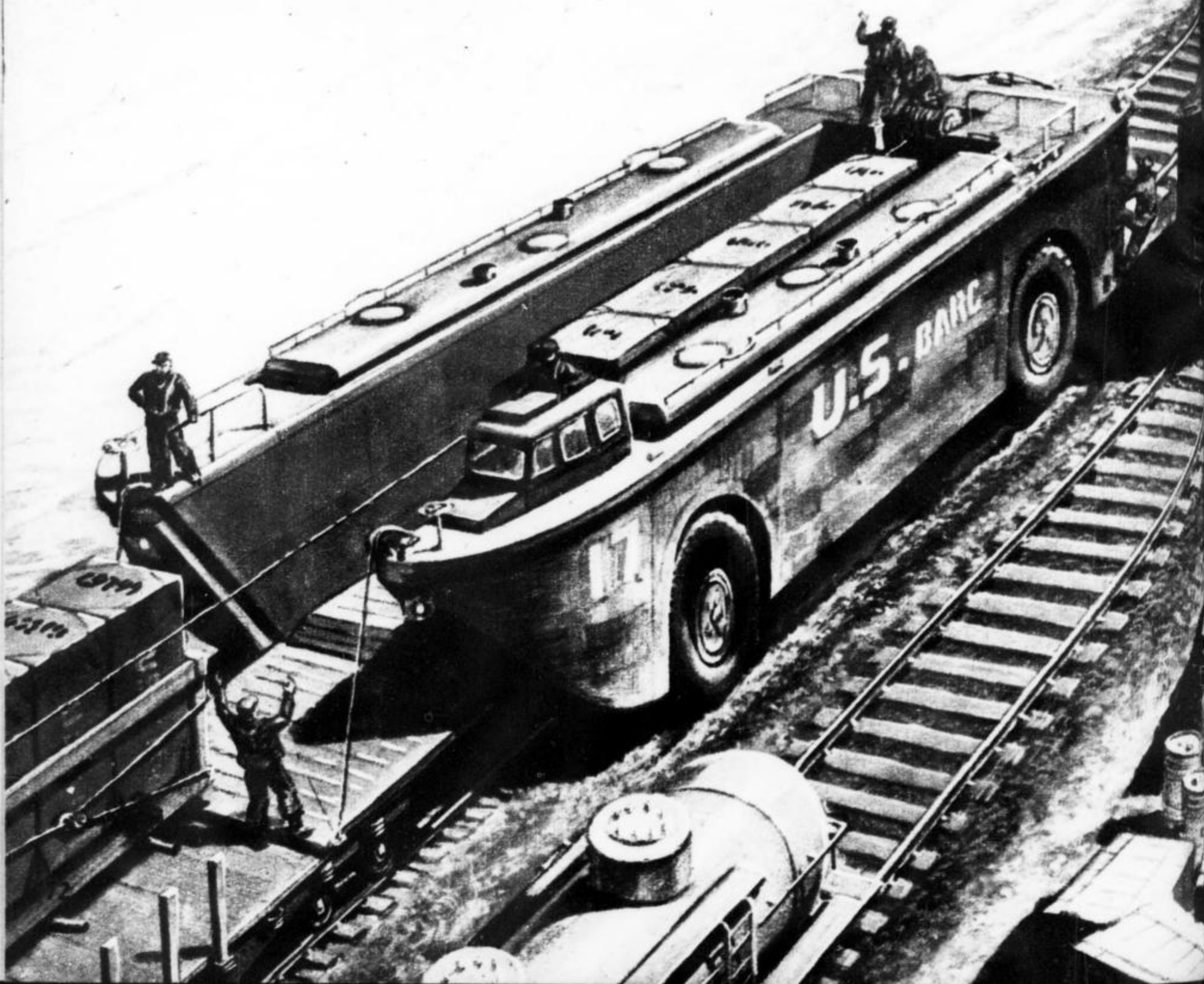
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BARC With a 60-Ton Bite

THE Army Transportation Corps' latest vehicle is the 60-ton BARC (Barge Amphibious Resupply Cargo). It's a sea-land behemoth designed specifically to haul heavy equipment such as big tanks, cranes and even railway locomotives in addition to artillery pieces and standard military items. It takes aboard its cargo from supply ships anchored off-shore and delivers it directly to the railroad flatcar or truck depot, dispensing with the difficult and inefficient job of handling material at the shoreline or beach. Its length is 61 ft., width 27½ ft., height 16 ft. •



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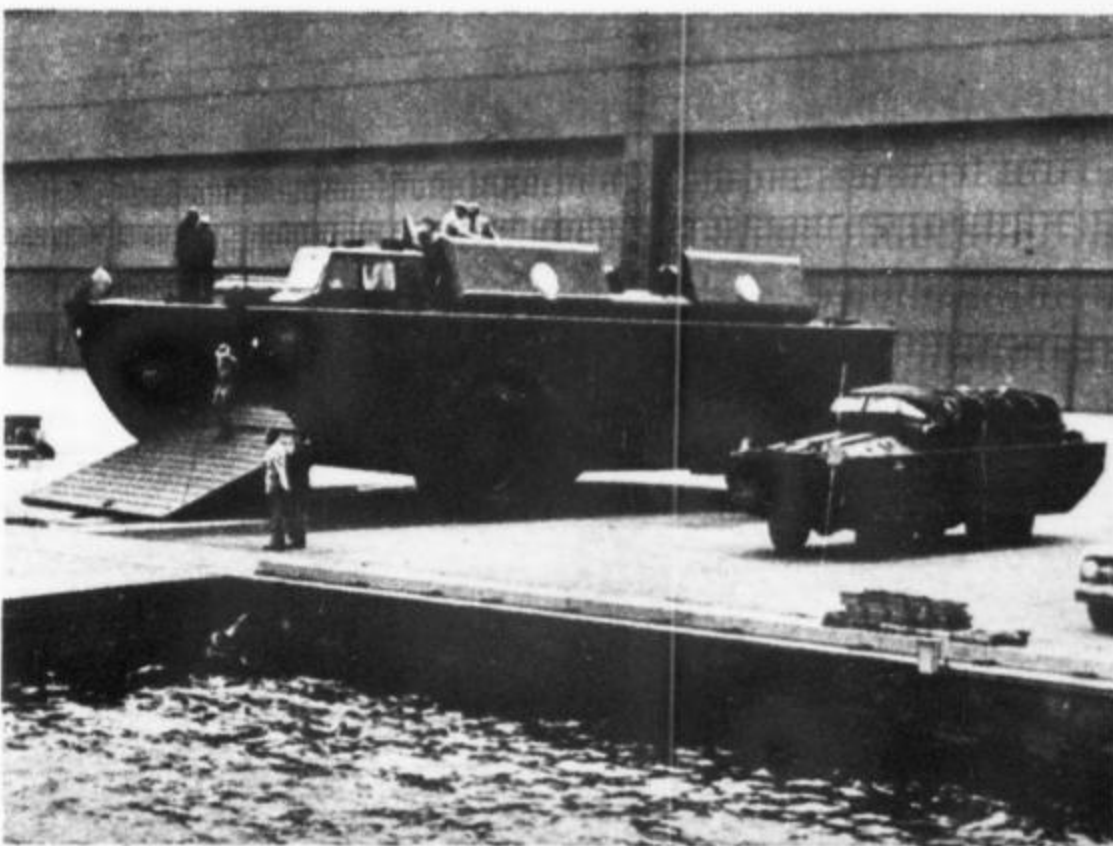
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Tires are 9½ ft. in diameter, weigh 3,300 lbs. each and their air pressure can be controlled from cab to meet changing ground conditions. Each wheel is separately powered by a 165-hp. Diesel operating through a torque converter. Above right, BARC disgorges a huge crane.



BARC, prior to its first water demonstration at Fort Lawton, Seattle, Wash., lines up with its World War II predecessor, the DUKW. Hatch covers, shown open, cover engines.



It is driven by twin propellers under the stern. Speed is secret. Driver's cab is at front left near loading ramp. Note removable steps which lead from hold to rear of cab.



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THE HOW-TO-DO MAGAZINE

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MARCH



TV TELEPHONE—One Of The
AMAZING MARVELS OF TOMORROW

See Page 68

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Cover: staff photo by Grayson Tewksbury

MARCH 1955

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Amazing Marvels of

TOMORROW

Here is an on-the-spot report
of what the future holds for you—by
MI's editor in the year 2055!

Recorded by O. O. Binder

GREETINGS, people of 1955, from the 21st Century!

This is Jon Graw, editor of *MECHANIX ILLUSTRATED* in 2055 A.D., speaking to you over the new Future Phone recently invented. Merely by dialing MI-1955, my call hooked into a time trunk-line that connected with your phone circuits. Thus, we of a century ahead can speak directly to you and give you a peek into your future.

Perhaps many of the things of which I shall speak will seem amazing wonders to you, too fanciful to be true. But don't underestimate your scientists and technicians of 1955, for they will produce inventions and make discoveries of which you know nothing as yet, or hardly dream of. If not you, then your children or grandchildren will see them come to pass, one by one.

Suppose we take you on a tour of our world of 2055, as if you had been bodily transported here and saw it all with your own eyes. Suppose, too, that you are a typical citizen of our time, living in a suburban community.

A typical community of the future—covered with a giant Glassteel shell and weather-controlled.

Art by Gurney Miller



COVER STORY



Amazing Marvels of

TOMORROW

First, you waken in the morning as an alarm chimes softly, musically, silently—in your mind! Electronic impulses from a supersonic alarm clock come directly into your brain without creating a raucous noise for all annoyed ears within range.

You jump out of bed and dress in clothing made of finely woven glass wool that is almost wear-proof, stain-proof and unshrinkable. Or perhaps you prefer the cheap disposable paper suits, firm enough to last a day and simply discarded at night. You wear a brand new ensemble each day. For some reason, it is more popular with women than men!

You turn up the heat, which gushes from an Atomic Furnace that works smoothly for a lifetime on one charge of fission fuel. No more messy coal, oil or gas. Or fuel bills. In the kitchen, you turn the dial of your Meal-o-Matic unit to Breakfast No. 3. In a few seconds, prepared and cooked by the swift electronic stove, out pops your two soft-boiled eggs, toast, coffee and sweet roll.

Your toast and butter, by the way, are ersatz—but you wouldn't know it. They come from the Food Factory which duplicates the intricate chemical processes of nature to produce edible foods. The raw materials are oil, water and air. Don't give us that fishy eye. Back in your world of 1955, Dr. Robert E. Wilson of Standard Oil of Indiana pointed out how large scale artificial foods would soon be possible.

In 2055 your food will be prepared by the electronic Meal-o-Matic. Just turn the dials to the meal desired and out it pops, hot and savory.

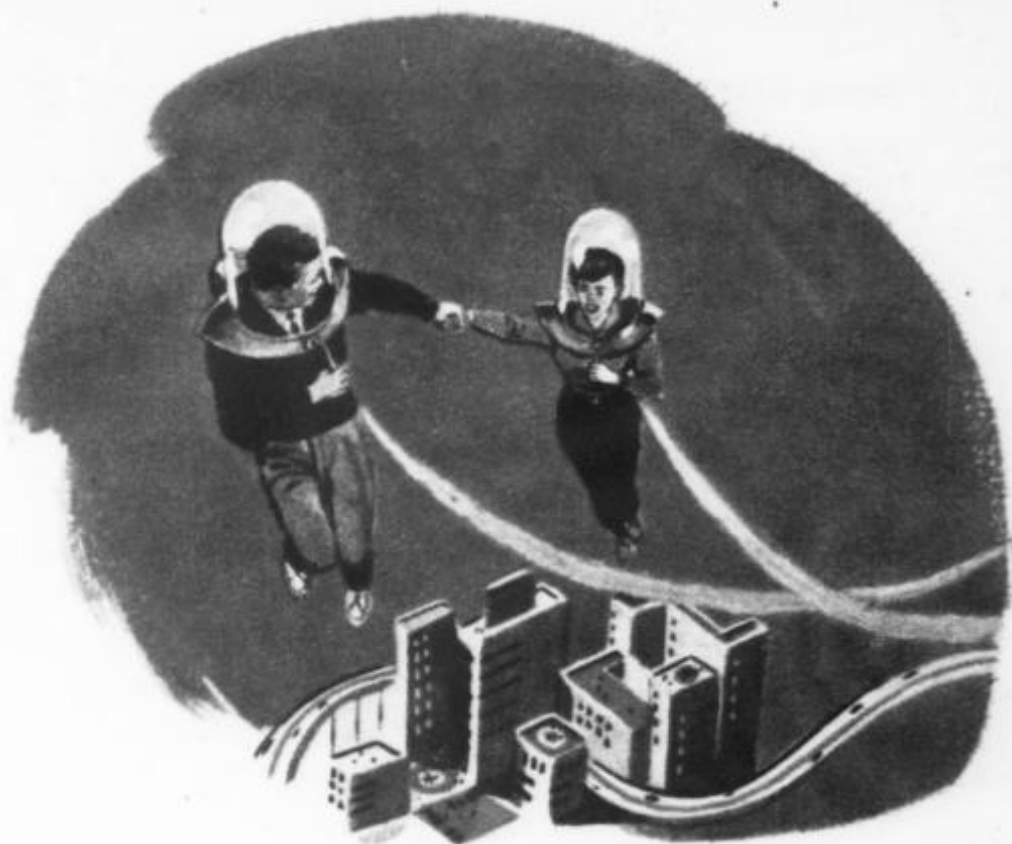


Business appointment in Iran in 30 minutes? You can make it easily on a rocketliner that soars 50 miles above the Earth, speeding at 40 Machs.

With a slight change in catalytic processes, he predicted, crude oil could be converted to acetic acid. This, with proper oxygenation from plain air and solution in common water, could be built up into fatty acids and carbohydrates—basic “building blocks” of food. Further simple steps would yield a wide variety of edibles like bread, sugar, butter—even meats.

While you eat, you snap on the TV News. One whole wall is the picture tube, showing life-size figures and events from all over the world. You watch tourists lolling at the resort on the top of Mount Everest, half-way around the world, not by kine-scope but as it happens at the moment, via UHF relay circling the globe.

Now you step outdoors, breathing deep in delight. It is the freshest air you ever



Commuting has become a pleasure with individual Shoulder Jets, powered by atomic fission. Air-lanes are marked by balloons at various levels.



MI of 2055 will be sold in film reel form, to be projected on a wall viewer. Sound strip accompanies photos of the do-it-yourself projects.

knew, entirely free of dust or pollution. How can this be in a crowded civilized area? You'll see in a moment.

First, your eyes see the usual streets, homes and playgrounds of the typical suburb. But look up. You are astonished to see that the whole sprawling township is covered with a giant glass-like shell. Instead of fragile glass, however, it is Glassteel, patented back in 2012, a building material transparent as glass but strong as steel. The snug town beneath is safe from breakage or any outside disturbances.

In fact, looking beyond the Glassteel roof,

you see dark clouds up there and a storm raging. Yet within it is sunny and peaceful, an ideal summer's day. That is due to the sun lamps hanging at spaced intervals, shedding down powerful actinic rays or artificial sunshine. Let it storm or hail or snow outside, you have sunshine inside—on order.

In short, the enclosing Glassteel shell allows the community to control its own weather, completely. That is why the air you breathe is so pure—100 per cent air-conditioned. Fog, smog, soot, ice or excess humidity can never happen. Need rain for your gardens? Just turn on the sprinkler system along the ceiling. You will never

TV Telephone (shown on cover of this issue) has viewing screen connected with dial system, results in some interesting accidents like this.



Amazing Marvels of

TOMORROW

see a flood here, or a drought. Rain comes by command only, and only when needed.

Now, as you look up, you see the catwalks running along the Glassteel roof for workmen to use to make repairs or to clean the upper side when storms leave debris. The roof is miles across and its immense weight is supported by huge concrete structures on all sides. But look closely and you'll notice they are hollow, with windows and doors. Some serve as roomy apartment buildings, others to hold wind tunnels for the air-conditioning system, still others as power stations.

The latter, of course, house mighty Atomic Dynamos which supply all the electricity needed from atomic reactors. This is probably not too surprising to you as even in 1955, at what we call the beginning of the Atomic Age, you had experimental piles for heat and power, and as engines. Today, they are all perfected and in world-wide use. Even the Eskimos have Atomic Refrigerators now.

I'm afraid your doom prophets of 1955,

Bored in the evening? Just buy a robot kit and make yourself a brainy partner for an invigorating battle at 2055's three-dimensional chess.



somberly predicting the collapse of civilization through dwindling natural resources, would have red faces today. Coal, oil and natural gas resources are practically obsolete as power producers. Atomic energy is the great work-horse today. Besides specialized fission and fusion, we have *functional* atomic power. That is, we draw it now from anything on Earth, like common rock, turning it on and off with ease. We venture to guess we won't run out of rock for atomic fuel for some time.

Strolling through Domeville (incorporated township name) you pass many shops displaying the wares from our assembly lines. Many are from Robot Factories that are completely automatized without a single human workman inside. You had the forerunners of this in your 1955 pilot plants, like those of the oil distilleries, which were completely mechanized. We've extended that to where most of mankind is free of ordinary labor.

Our working week? Still 40 hours. Somebody has to make all the machinery, you know. But the net result is an industrial capacity dozens of times greater than in 1955.

A bookstore catches your eye now, with its seemingly extravagant sign—Indestructible Books, Guaranteed Forever. Blatant swindle? Pick one up and see how its pages are magnesium welded into a cover of titanium. Both are extremely light metals so that the books weigh no more than paper ones. Resistant to corrosion, fire and wear, these metallic books are proof against ordinary damage and the passing of time. They will last, if not forever, at least a thousand years.

Now you are ready to go to your office in the nearby big city. Subway—trolley—bus—train? No, don't look around for them. You have a much better, faster and superbly simple way to commute. Pick up your personal Shoulder Jets there, at the checking counter. You strap them on and press a button. With a powerful but softly muted hiss, the jets blast behind you, propelling you into the air. Yes, you are flying like a bird.

Don't be frightened. Almost everyone uses individual flying jets these days. A speck of fission fuel supplies the power for a dozen trips. With speeds up to 100 mph you set a course for the skyscrapers of the big city. Careful! Other thousands are swarming to work with you, filling the sky. Don't bump into them.

But there is no confusion or danger. You notice the lanes marked by anchored balloons, anywhere from 100 to 1,000 feet high. Hanging air buoys guide you into orderly

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Left, time for bed, and you're lulled to sleep by Dream-o-Vision which broadcasts telepathic dreams on any subject your tired brain desires.

channels. You just follow the signs—To City, One Way. Fast Lane Above. Pass On Top Only. There is an Air Traffic Cop ahead, blowing his whistle and chasing a speeder. He'll get a ticket for ignoring the posted speed limits, making like an eagle.

Don't worry if your jet unit fails while you are gulpingly high near the clouds. See that woman ahead, dropping? She only exclaims in annoyance about missing that sale in town, as her safety parachute automatically blossoms out of its compact receptacle attached to the jets. It lowers her gently below. She can get her jets repaired quickly at any Jet Station on the corner.

But to tell the truth, many businessmen cast a jaundiced eye when their secretary, late three times in a row, blandly claims her jets broke [Continued on page 208]

FREE! 50 GOLDEN HAMMERS!



WHAT invention do you think will be in general use in 2055? If you can come up with a good one *not* described in this article and drawings, you can win a bright, new Golden Hammer—MI's famous special award. We're giving 50 Golden Hammers for the 50 best Amazing Marvels of Tomorrow suggested by 50 of our most imaginative readers.

The invention you suggest must be described in 50 words or less. It can be in the fields of communication, transportation, entertainment, or any other part of modern living. Submit only one invention and address it to Tomorrow, MECHANIX ILLUSTRATED, 67 West 44th St., New York 36, N. Y. All entries must be postmarked no later than March 31, 1955. No entries can be returned and we cannot enter into correspondence with entrants.

Winners' names and suggestions will be published in a forthcoming issue of MI. You might be one of those lucky 50—so get busy! Those Golden Hammers are really beautiful!

OF MECHANIX ILLUSTRATED

JUNE

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20¢

Sand Sailer
See Page 68

ONE-STEP CAMERA THAT PRINTS ITS OWN PICTURES
HOW TO HANDLE A CANOE Picture Story in Full Color
BUILD AN 11-FOOT BOAT THAT FITS YOUR CAR TRUNK

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JUNE, 1947

VOL. XXXVIII, No. 2

On the cover: Color photo of Sand Sailer, by Ardean Miller, FPG

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SOUNDING
BALLOON
132,000 FT.



EXPECTED
ALTITUDE
OF NAVY
ASCENSION
100,000 FT.

UP

GOES PICCARD!

Scientist Piccard is preparing to climb
to 100,000 feet on a bunch of balloons.

BY LOGAN U. REAVIS

THE U. S. Navy, in collaboration with 21 of the country's leading scientists, is laying plans to send a "sky-laboratory" to a record altitude of 100,000 feet.

The sky-lab, a seven-foot aluminum sphere to be carried aloft by a cluster of balloons, will be jam-packed with instruments, and manned by the well-known physicist Dr. Jean Piccard and a Navy pilot.

ANDERSON-
STEVENS
72,395 FT.
1935

SETTLE-
FORDNEY
61,237 FT.
1933

A. PICCARD
53,152 FT.
1932

DONATI
56,152 FT.
1938

CIRRUS
CLOUDS
50,000 FT.

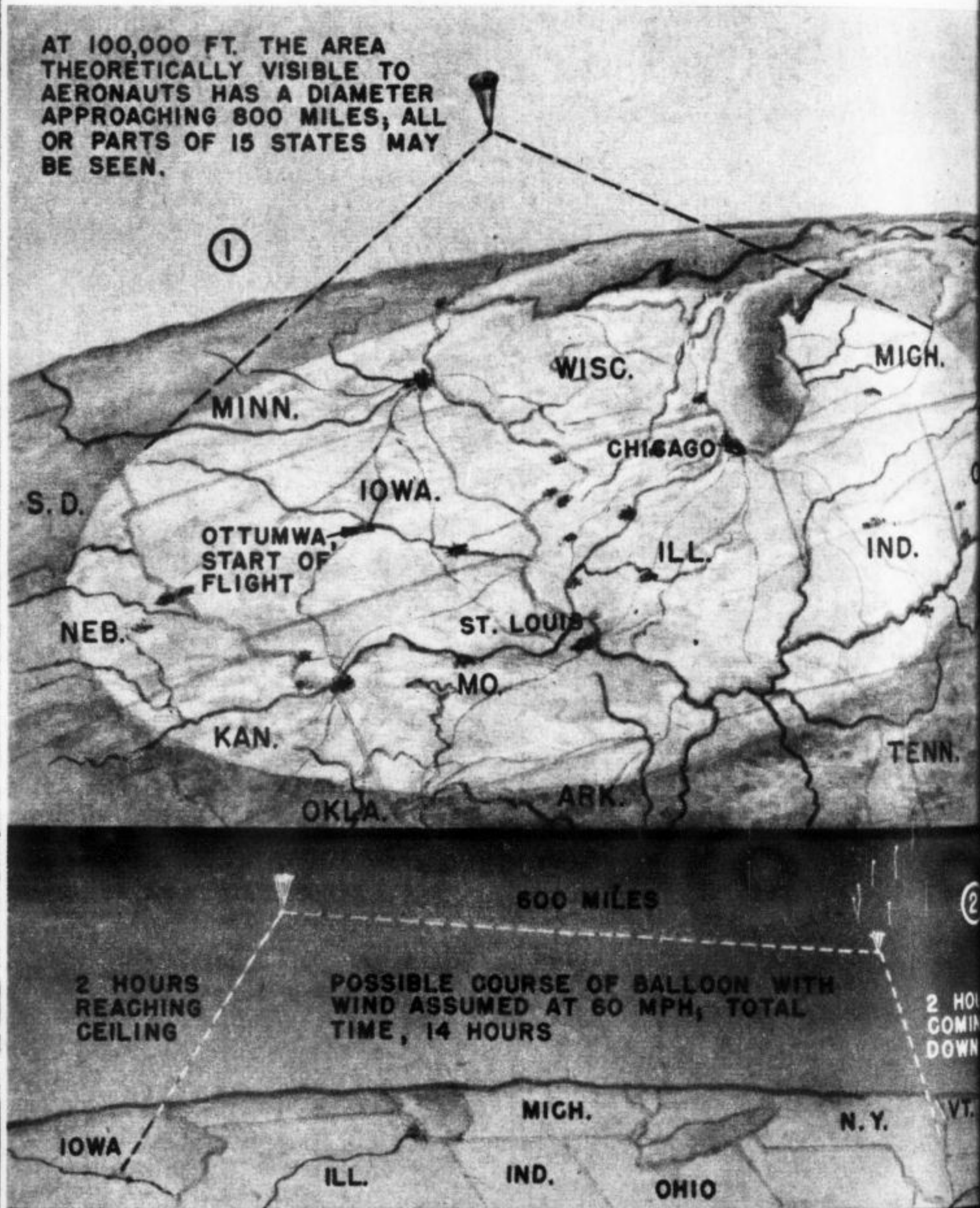
ANTI-
AIRCRAFT
SHELL
40,000 FT.

KITE
32,000 FT.

MT. EVEREST
29,141 FT.

HOW NAVY BALLOON
FLIGHT IS EXPECTED
TO COMPARE WITH
PREVIOUS RECORDS

AT 100,000 FT. THE AREA
THEORETICALLY VISIBLE TO
AERONAUTS HAS A DIAMETER
APPROACHING 800 MILES, ALL
OR PARTS OF 15 STATES MAY
BE SEEN.



INDIVIDUAL
BALLOONS
RELEASED
TO LOSE
ALTITUDE

RELEASED
BALLOON

③

BRIDLE
CONNECTS
CORD TO BAG

TRAILING CORDS
AFTER THEIR
BREAKING BY
CAPS' EXPLOSION

CLUSTER OF 80
COLORLESS
PLASTIC BALLOONS
100 FT. IN DEPTH
66 FT. IN DIAMETER
AT FULL EXPANSION



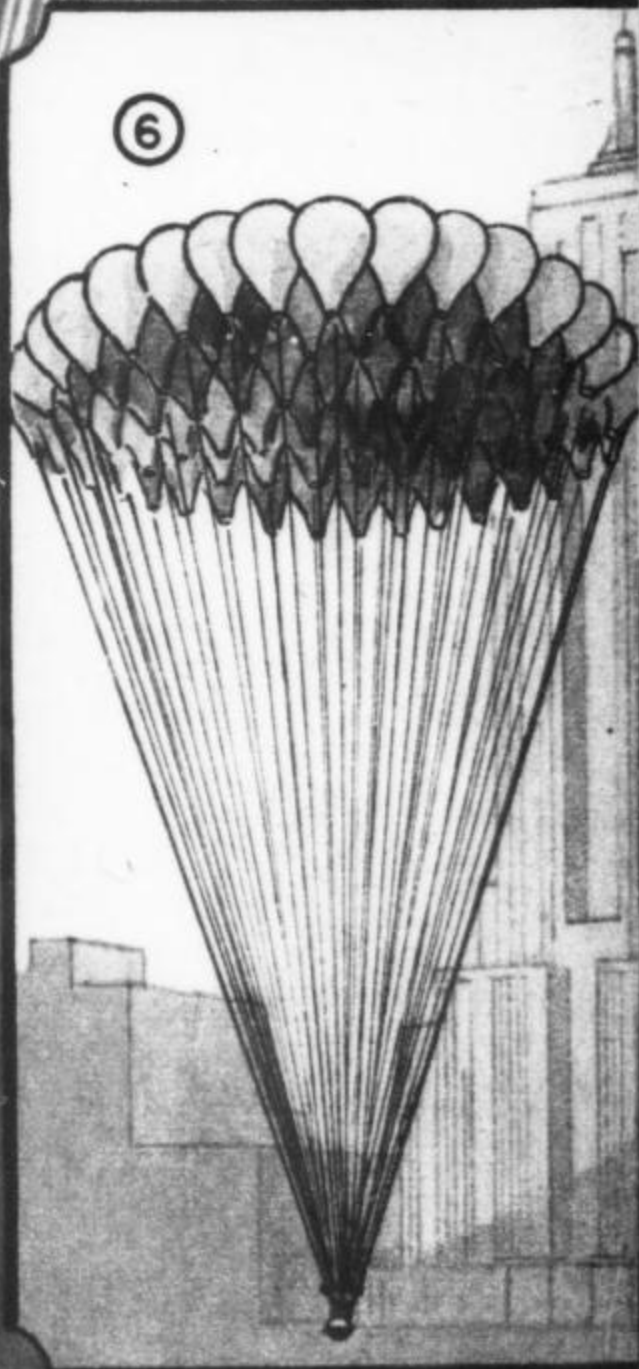
FOR RELEASING
BALLOON FROM
LOAD RING

④

SUSPENSION
CORDS 5/32
INCH THICK

CORDS 800 FT. LONG
FROM BALLOON TO
LOAD RING

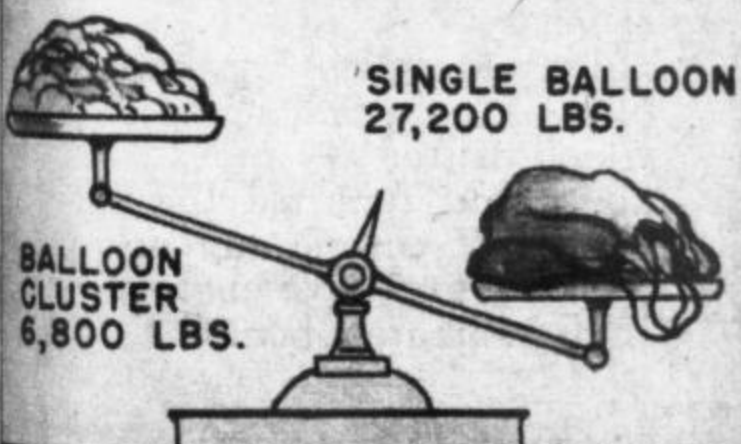
⑥



PARACHUTES
FOR GONDOLA

LOAD
RING

FULL HEIGHT OF BALLOON
ASSEMBLY AT FULL EXPANSION
—910 FT.— COMPARED TO THE
EMPIRE STATE BUILDING



BALLOON CLUSTER IS
SOME FOUR TIMES
LIGHTER THAN COM-
PARABLE SINGLE
BALLOON

⑤

Dr. Jean Piccard (left) at work on a mock-up of the gondola in which important new scientific data will be sought 19 miles above the surface of earth.

When, early some fair morning, helium begins streaming into an odd assembly of bags ringing the gondola at the Naval Air Station at Ottumwa, Iowa, finis will be written to the long succession of heavy single gas bag balloons man has used in his effort to rise above the earth. There, for the first time, a cluster of light-weight bags will be employed. And a plastic instead of rubber material will be used, as less liable to burn, rupture and suffer from abrasion.

The many balloons give an improved means of losing altitude. Instead of "valving" away the gas or rupturing the bag itself, as in previous balloons, the cluster arrangement allows simple release of entire units. Detachment is effected by means of an explosive cap affixed to each cord. The cap is covered by a protective casing to prevent premature trouble, and is detonated by a wire leading from the gondola. The balloon and attached piece of cord float away, later to explode as the enclosed gas bursts its covering in the far upper regions. In the final descent enough bags are liberated to permit an easy landing. If the cluster acts like a parachute, bringing danger of dragging along the ground—as it may—all the remaining balloons may be released.



Should the aeronauts feel disposed at any time to accelerate their rise, they may drop some of the 1,280 pounds of ballast which will be carried.

The course of the strange aerostat will be followed by immense numbers of radios, theodolites, and other instruments.

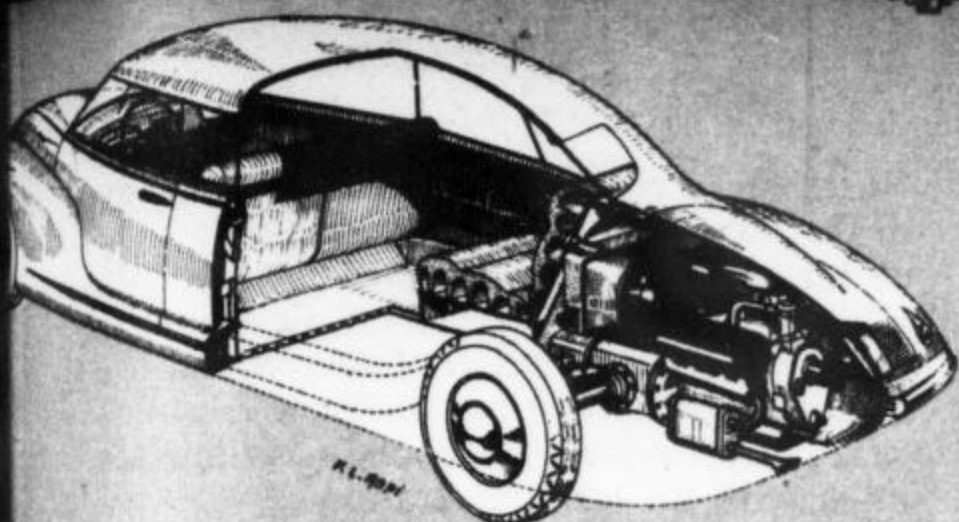
The flight is expected to obtain valuable data on light, temperature, sound and the mysterious cosmic rays. The long drift through the upper air will afford an opportunity for sustained study of the reaction of the instruments to feeble but perhaps extremely important radiations. (Rockets and sounding balloons are unable to give anything like a continuous record at uniform altitudes.) The gondola will be free from vibrations. The steady reaction of the instruments may well catch the first telltale indications of dangers which must be faced by the first voyagers into interplanetary space.

The Russians sent up a high-altitude balloon in 1945 which drifted 500 miles in 17 hours and reported the discovery of cosmic ray action with the explosive characteristics of an atom bomb! •

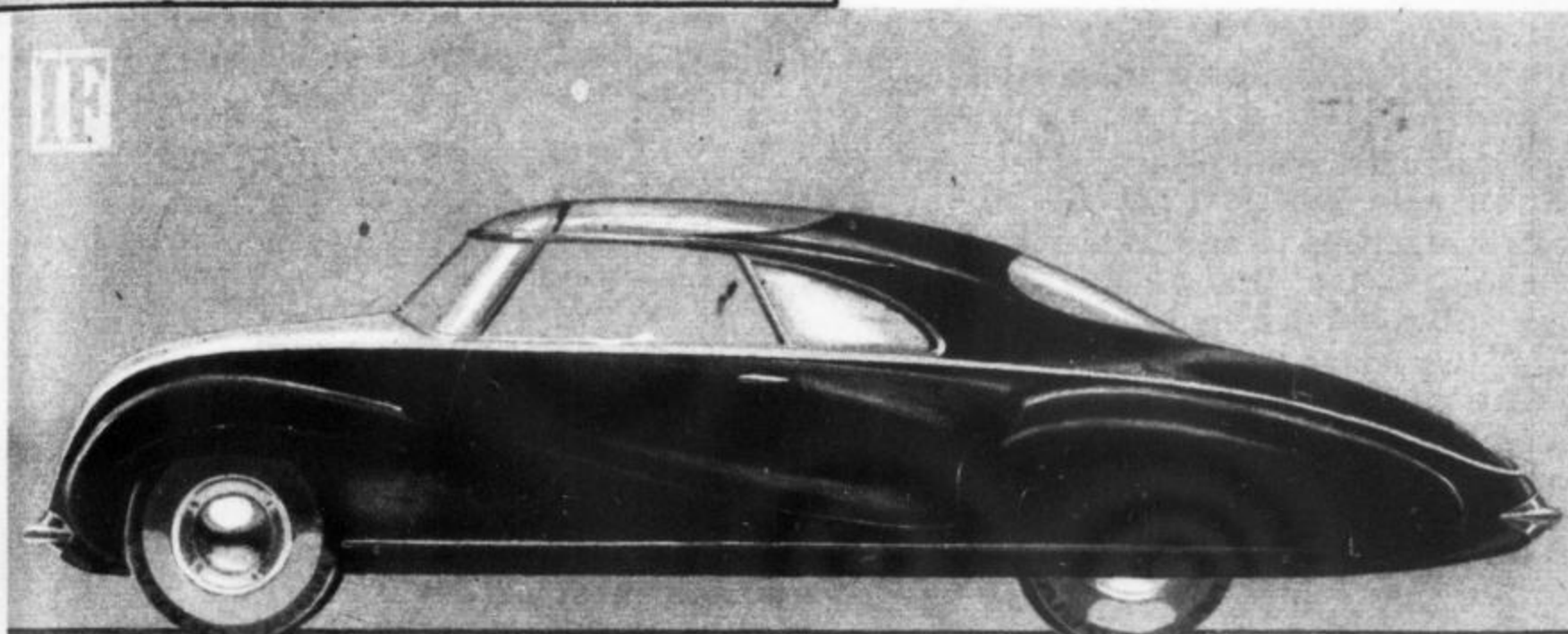
Dr. Piccard, holding a thermometer of his own special design, stands with his wife before a sketch of the revolutionary cluster balloon.

Mechanix Illustrated





t o u r i n g v e r a n d a



IT'S a veritable porch-on-wheels, or touring veranda, according to American observers of Italy's latest bid for prestige in the luxury automobile field. Its official name is the IF Car Type 8C. IF stands for the Isota-Frashini automobile works of Milan, Italy, and C. F. Rapi—who drew the sketches shown above—is the firm's chief designer. The car's top and sides are of Plexiglas and the windshield—minus the usual center strip of metal—is of shatterproof glass. Power is

supplied by an airplane type, 8-cylinder, V-shaped engine, which the designers say will propel the car with ease at 93 mph. The rear engine permits the body to clear the ground by only eight and one-half inches. The motor is water-cooled and has a low, wide radiator with twin fans. And here's good news to flat-fixers: four automatic jacks fixed to the steel frame can be operated from a control handle inside the car. The gas tank, spare tire and tools are under the hood. •

Midget Recorder

IT'S small enough to fit in your pocket and it will record what you or anyone else says for 66 minutes, with or without other persons knowing a record is being made. The midget recorder consists of a magnetic wire .004-inch in diameter—about the thickness of a human hair—which is fed from one reel to another through a magnetic recording head. As sound enters the microphone it is electronically converted into a magnetic field which magnetizes the wire. The magnetized wire permits the reproduction of the sound so recorded. The sound can be removed by demagnetizing the wire. The device weighs only three pounds and can be worn concealed or carried in a case like a pair of binoculars. •

June, 1947



HELICOPTER BUS SERVICE

**Integrated bus-helicopter-airline
service will save time and nerves.**

BY ANDREW MESSICK

PRESENT airline travel is fast and comfortable once you get into the air. The catch is getting to and from the airport. It's a shocking fact that airline patrons spend from 30 to 60 per cent of their total travel time in surface vehicles.

Bus companies now have elaborate plans to change all this with passenger-carrying helicopters integrated with ground-bus feeder lines. And they are not stopping with the problem of getting airline passengers

worthwhile making the tedious journey to the fixed-wing aircraft terminals even under the best of conditions.

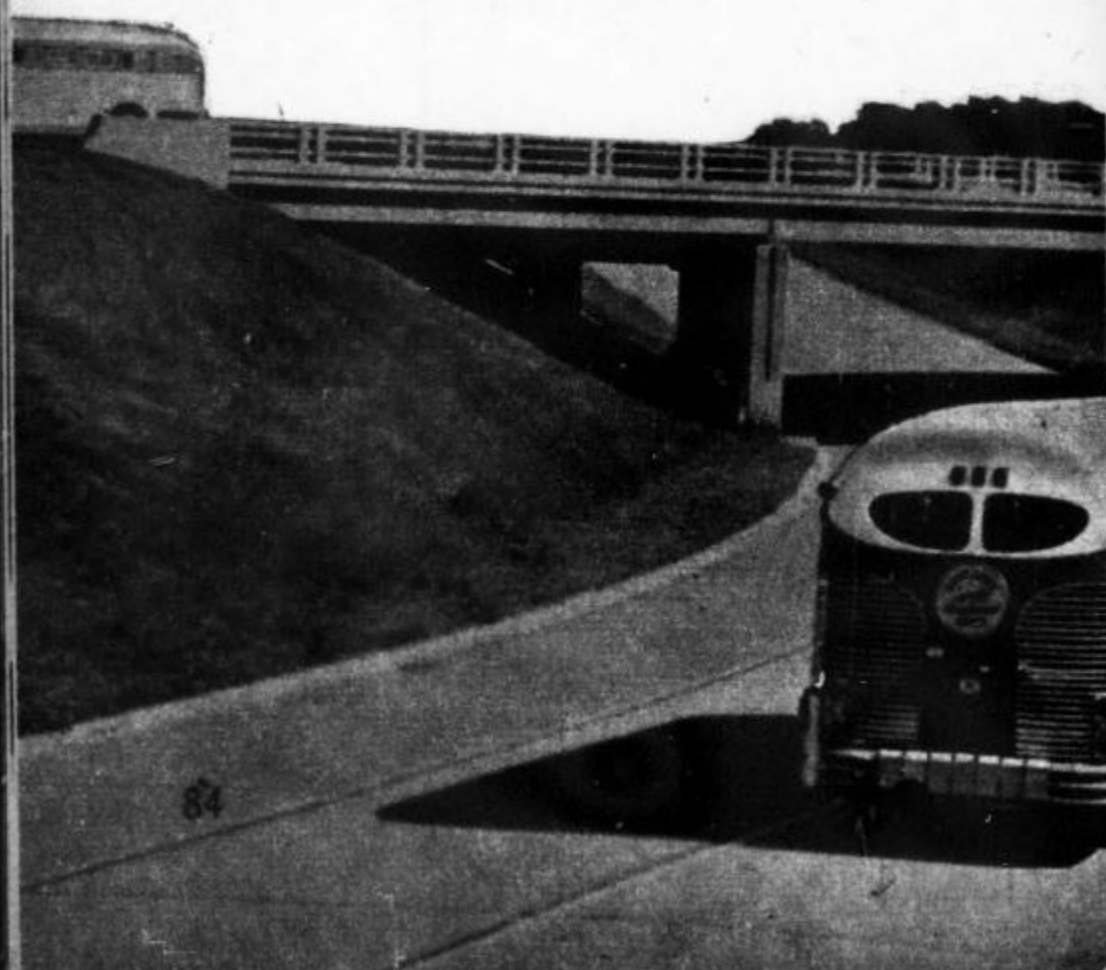
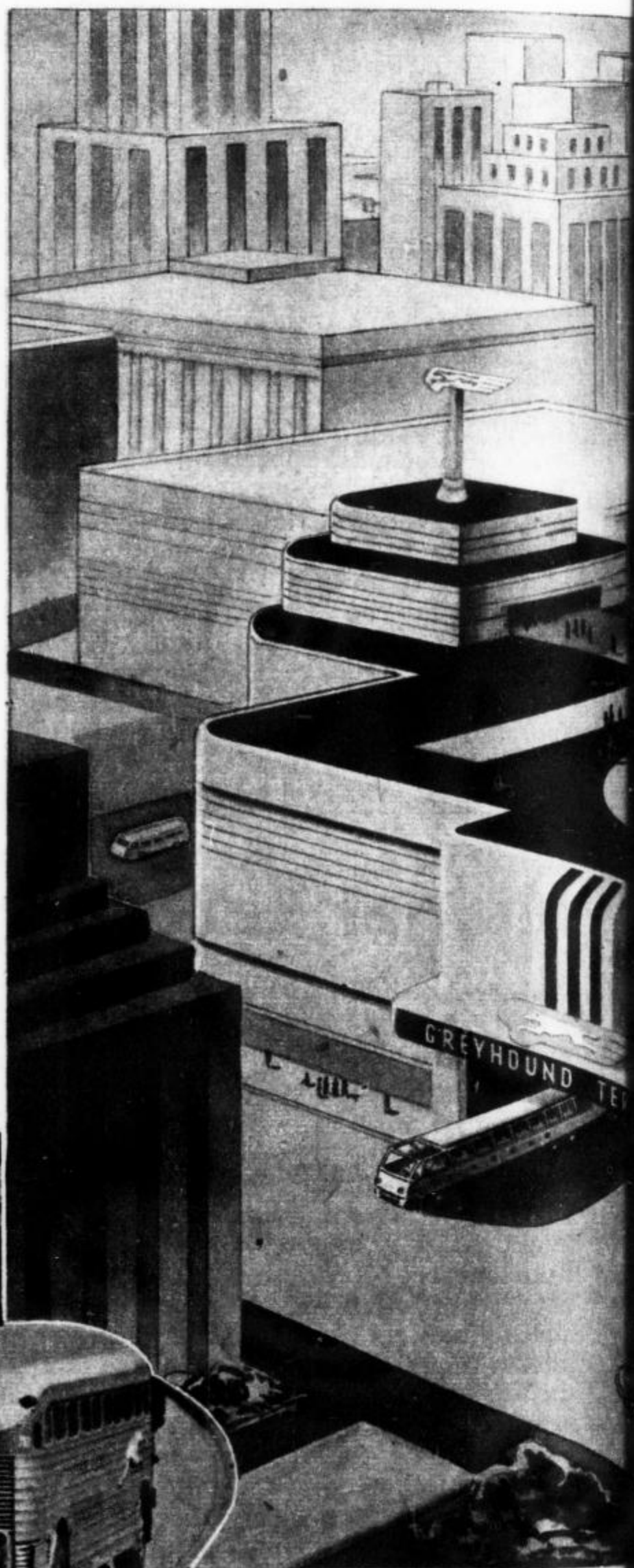
They also expect to bring air travel to the thousands of small towns which are not covered by the big airlines. An integrated system would coordinate surface lines with air-ground stations.

These plans are not mere speculation. More than 80 bus lines have applied for permits to operate helicopters for pas-



to and from outlying airports. Far from it. They have a sharp ear for all demands for air transportation not met at present by existing airlines, especially those for short hauls.

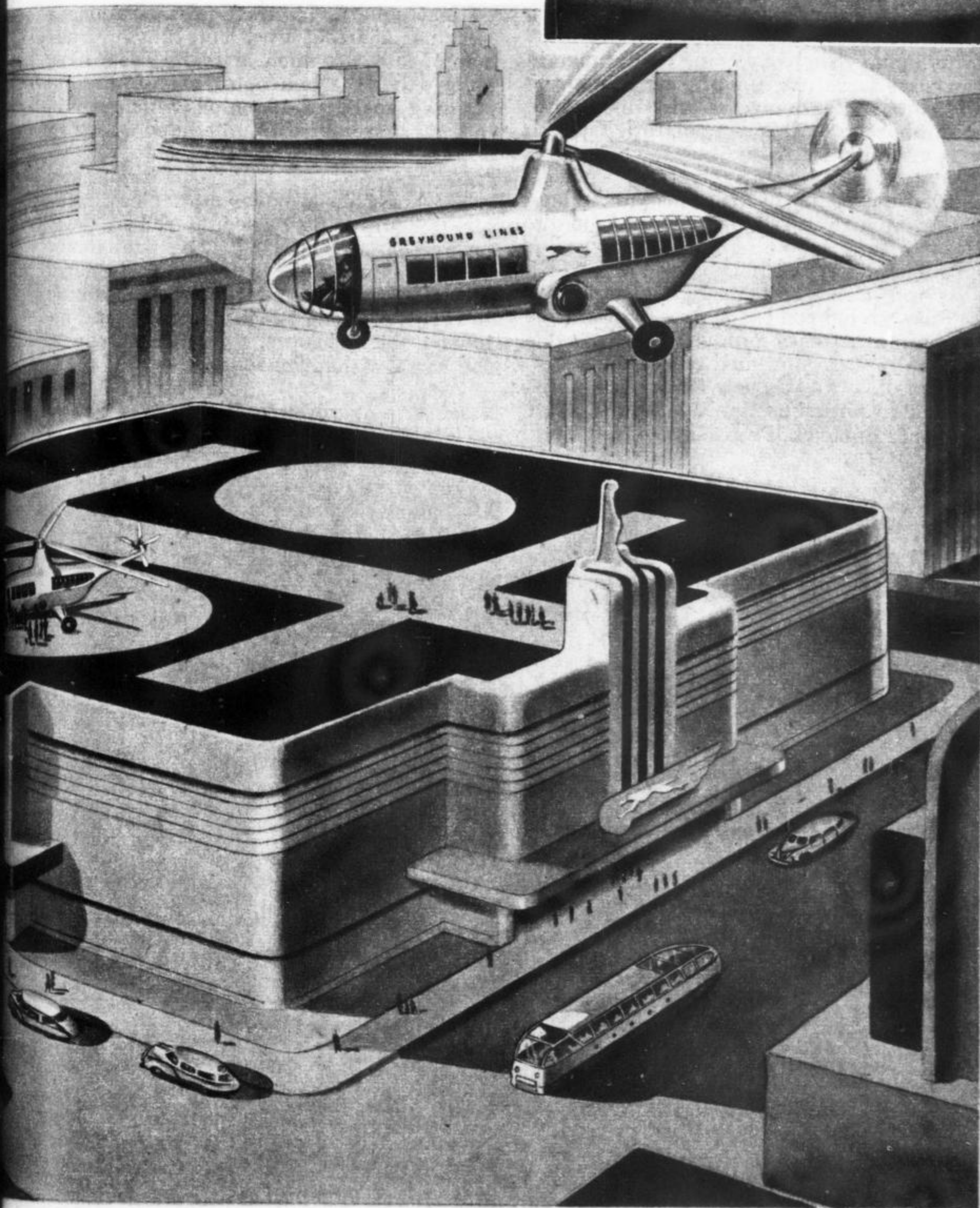
The bus lines point out that 50 per cent of all trips made by bus passengers are for distances under 50 miles, and that another 39 per cent are for distances between 50 and 250 miles. For short trips it is seldom



Mechanix Illustrated

senger transportation. Things will be popping when, and if, the Civil Aeronautics Board gives the go signal. Present interpretations of the Civil Aeronautics Act would prohibit companies engaged in other forms of transportation from entering the aviation field. Bus companies are waging a fierce battle for interpretation in their favor. Services have already been

Greyhound is planning airbuses like model, right. Below: A future air-ground terminal.



planned and designed by Greyhound and other companies of the nation for air transportation which is not practical at present for fixed-wing aircraft.

Greyhound officials, in connection with leading aircraft authorities, are convinced that the helicopter is the aircraft best suited for local air service. The practicability of the helicopter, moreover, has already been thoroughly established through its acceptance and development by the Army.

Feasibility of integrated air-bus service was first demonstrated near Detroit. Two Sikorsky S-51 helicopters purchased by Greyhound Skyways for experimental purposes were used for the first flights in the actual interchange of passengers with motor coaches. This demonstration, which was attended by Igor Sikorsky, helicopter inventor, and by bus company officials, proved the ability of the helicopter to land safely at highway intersections or in the limited space adjoining bus terminals.

In each case the helicopter landed in a fifty-foot circle with negligible horizontal motion, exchanged passengers with waiting buses in a matter of minutes, then ascended vertically and continued its journey.

"Not only can this new air service be coordinated with bus line operations," said Manfred Burleigh, President of Greyhound

Skyways of Michigan and the Great Lakes Greyhound Lines, "but, it can also act as a 'feeder' service to the present lines."

Mr. Sikorsky pointed out that while the experiment opened an entirely new field for use of helicopters, its adaptation presents no problem.

"On the basis of both our engineering and operational experience, we believe it entirely possible to build helicopters to carry a dozen or even a score of passengers in the near future," he said.

A large helicopter can land in an area 80 feet square. In practical operations a terminal 250 feet by 300 feet would accommodate two such aircraft. Tests have shown that the helicopter has an efficient cruising speed of 100 mph which would indicate a reasonable scheduled speed of approximately 90 mph.

Because of the ability to maintain low speeds, or even to hover motionless in the air, difficulties now encountered in foggy or overcast flying conditions are almost entirely eliminated. In the unlikely event of motor failure, the large rotor continues to revolve, acting as an air brake, and allowing the helicopter to settle slowly to the earth without mishap. •

Buses have already taken to the air in successful tests made by Greyhound Skyways' two S-51's.



Electric Cannon



This slow-firing, powder cannon throws a 16-inch shell 20 miles. Turn page for electric gun drawing.

BY WILLY LEY

**Rapid rate of fire—one shell per second—
may be possible with electric propulsion.**

NOT long after Pearl Harbor several popular magazines published in Germany and in German-dominated France began to carry articles about a wonderful new German weapon. It was said that German engineers had developed a new type of long-range gun, capable of firing a distance of 125 miles *at the rate of one shell every second*. The secret of such fantastic performance, it was explained, was that these long-range guns did not use powder to propel their projectiles, but electric current.

From the fact that these articles appeared during the war several possible conclusions could be drawn. One was to take the articles at face value, but that did not jibe well with the habits of military security. Another and more likely conclusion was that the Germans actually had such plans, but that for some reason they had given up. And while it did not make a weapon, it made good propaganda.

U. S. Army reports, recently released, prove that the second conclusion was correct. The Germans did work on electric artillery experimentally as well as theoretically. So did the Japanese. But neither was able to carry research and experimentation to a useful conclusion.

The idea of the electric gun is not a novelty by any means. There are quite a number of patents on electric guns (most of them German) and a number of inventors have actually constructed experimental models.

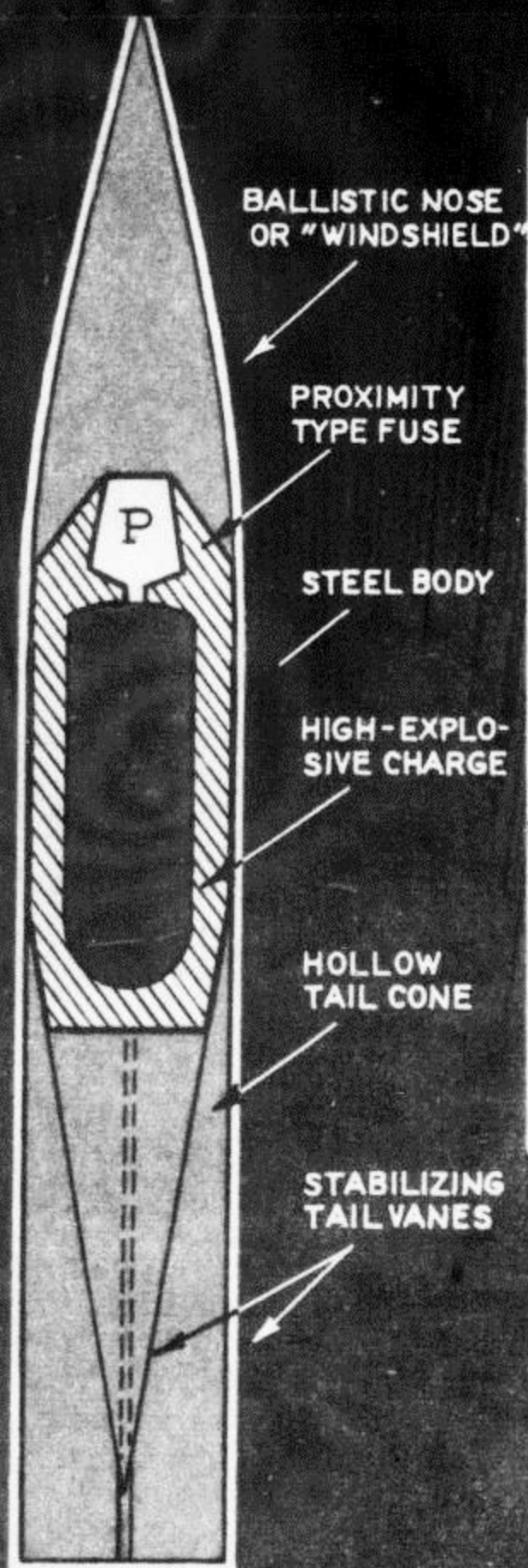
Most famous of the electric gun inventors was probably Dr. E. F. Northrup, inventor of the Ajax-Northrup high frequency in-

duction furnace which is in use all over the world. Dr. Northrup was interested in electric guns mostly for the purpose of using them to launch large-size rockets—another idea which military investigators found marked down in the notebooks of the Nazi scientists.

An electric gun does not have a real barrel; its "barrel" is a series of coils, wound around an empty space in the middle. They are technically known as solenoids. In practice and under heavy electric loads, Dr. Northrup found, wire coils heat up too fast and too much. For this reason he began to use hollow copper tubing instead of solid copper wire. Cold water, kept circulating through the tubes, prevented dangerous heating even under heavy loads.

If an electric current is sent through the coils and a metal object inserted into the coil the object will show an induced current. That in itself might not do more than just hold the object rather rigidly in the center of the coil. But if you have a long barrel built up of coils and send, let us say, a three-phase current through the series of coils, a curious thing will happen. The "wave" of current sweeping through the coils will want to pull the object along. It will succeed the better, the more powerful it is and the longer the series of coils. When the object arrives at the other end of the tube it will keep on going, since there is nothing to stop the momentum acquired inside the tube. Nothing, that is, except air resistance and the action of gravity, but these two need time to work.

I say "object" because it does not need



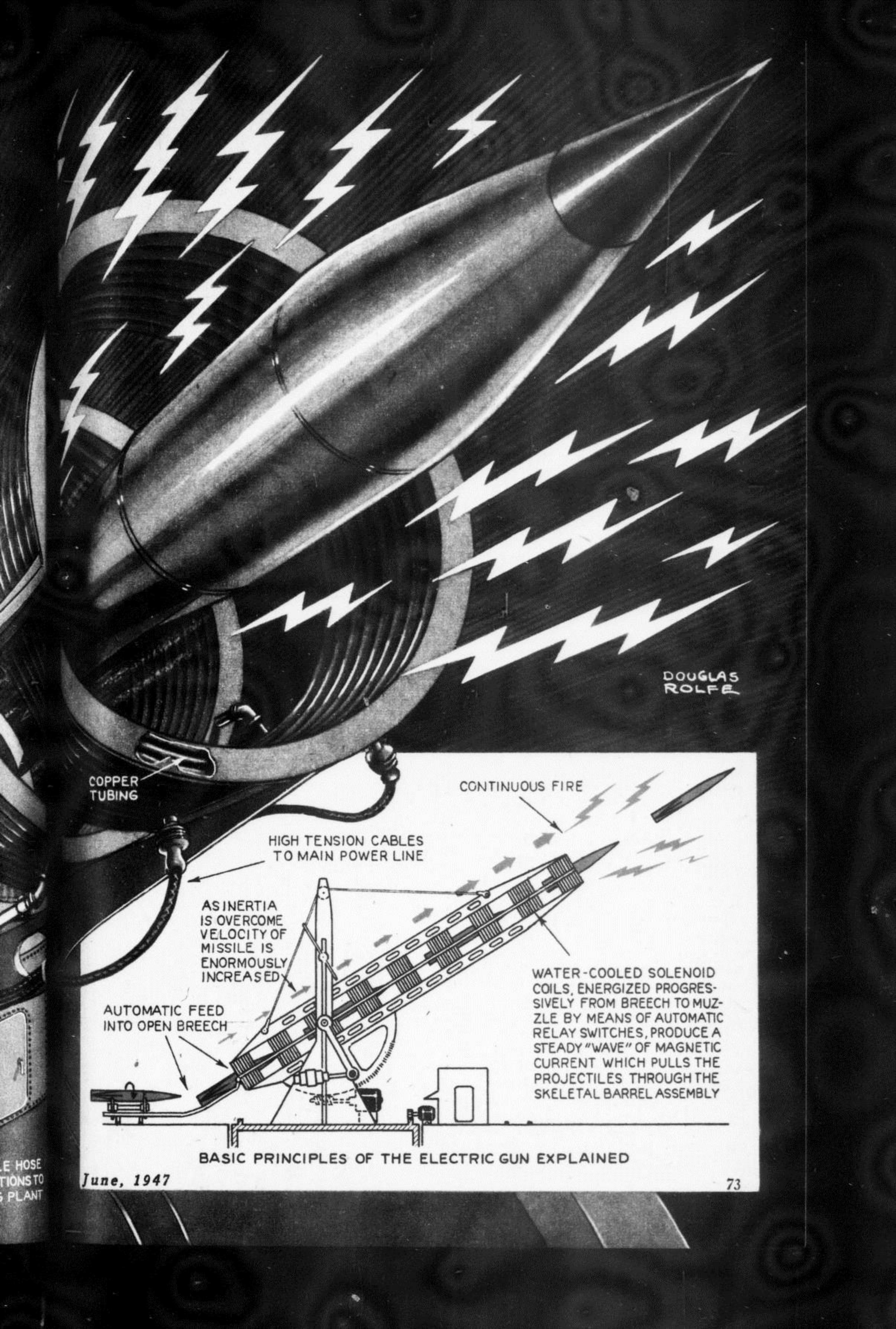
SECTIONAL VIEW OF
PROBABLE PROJECTILE

RADAR-
DETECTOR

to be a bullet or even have the shape of a bullet. But the proper shape, of course, is that of a projectile because it overcomes air resistance best. Since there is no way of making it spin, it would have to be fin-stabilized.

The advantages of such a scheme are great. But so are the disadvantages. The main advantages are these: since an electric gun does not need a breech-block mechanism and since the interplay of electric forces inside the gun carries the projectiles away about as fast as they can be fed in, the rate of fire can be tremendous. The shells could literally be fed in by means of a moving belt. The other major advantage is that an electric gun can produce a much higher muzzle velocity than a powder gun. There is a limit to the pressures which gunpowder can produce in a gun barrel. [Continued on page 164]

FLEXIBLE HOSE
CONNECTIONS TO
COOLING PLANT



DOUGLAS
ROLFE

COPPER
TUBING

CONTINUOUS FIRE

HIGH TENSION CABLES
TO MAIN POWER LINE

AS INERTIA
IS OVERCOME
VELOCITY OF
MISSILE IS
ENORMOUSLY
INCREASED

AUTOMATIC FEED
INTO OPEN BREECH

WATER-COOLED SOLENOID
COILS, ENERGIZED PROGRES-
SIVELY FROM BREECH TO MUZ-
ZLE BY MEANS OF AUTOMATIC
RELAY SWITCHES, PRODUCE A
STEADY "WAVE" OF MAGNETIC
CURRENT WHICH PULLS THE
PROJECTILES THROUGH THE
SKELETAL BARREL ASSEMBLY

BASIC PRINCIPLES OF THE ELECTRIC GUN EXPLAINED

June, 1947

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MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

Sept 58
ALL ABOUT TAPE RECORDERS

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SEPTEMBER

Tom McCahill
Tests The
NEW Small Ford

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Cover Photo
from Tom McCahill

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GRASSHOPPER INFANTRY



FRANK TINSLEY '58

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ROCKET-POWERED belts would enable attacking infantry to jump 100-yard streams in giant bounds to wipe out the surprised enemy.

By Frank Tinsley

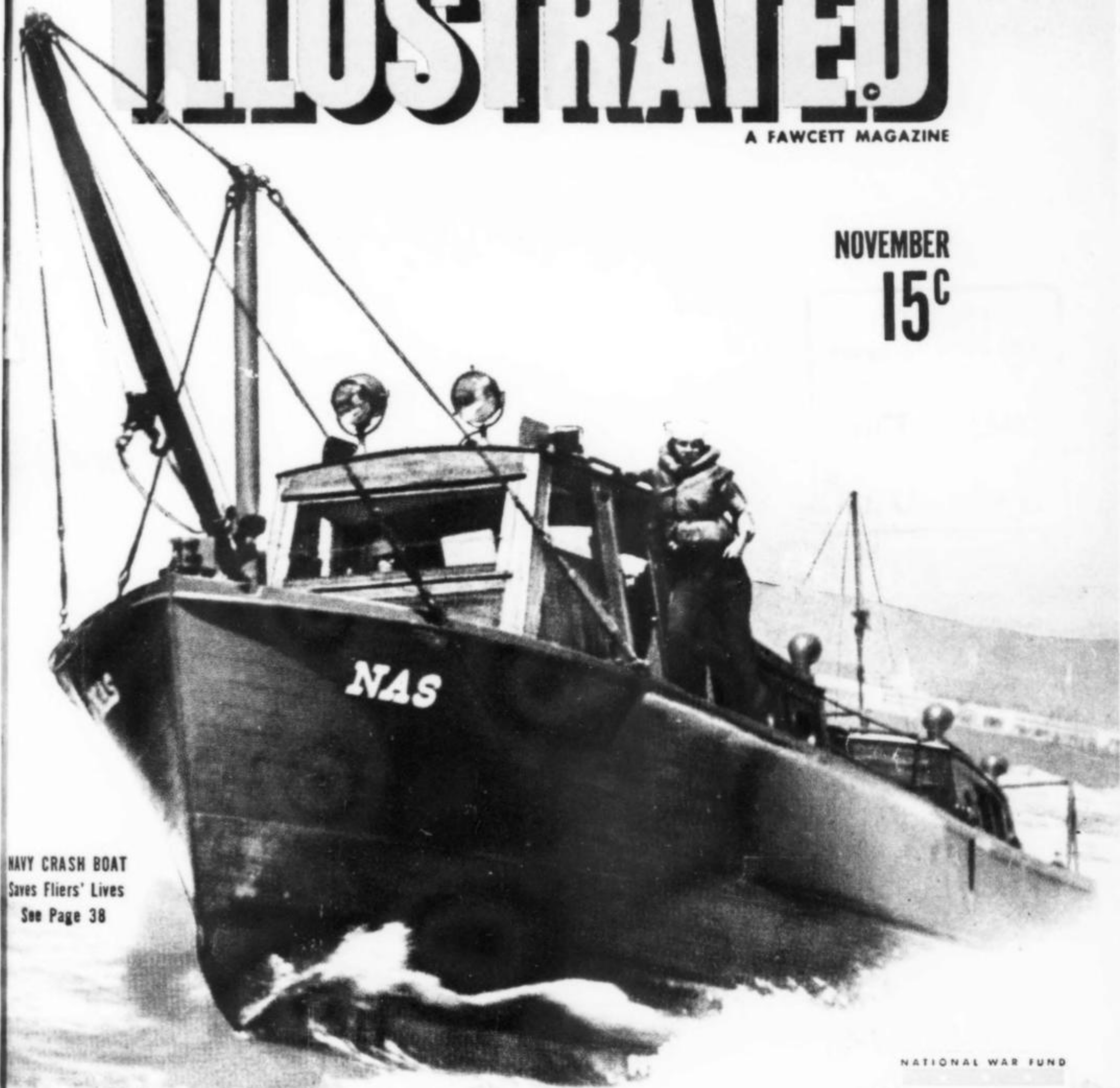
THE enemy rear guard has withdrawn across the little stream and awaits our advance. Lying in hastily-dug fox-holes, they stolidly watch as U. S. infantrymen filter through a belt of distant trees toward the cleared stream bank. A few enemy mortar shells send geysers of earth skyward but beyond this, the delaying force holds its fire. Soon the well-dispersed GIs will have to leave their leafy cover and bunch up in the clearing to ford the stream. Then the enemy will open fire!

Suddenly a squad of Yanks bursts from the trees and zooms across the clearing in fantastic running leaps. Trailed by jetting plumes of smoke, they sail over [Continued on page 150]

MECHANIX ILLUSTRATED

A FAWCETT MAGAZINE

NOVEMBER
15^C



NAVY CRASH BOAT
Saves Fliers' Lives
See Page 38

NATIONAL WAR FUND



FOR OUR OWN - FOR OUR ALLIES

FUTURE OF THE ROBOT PLANE

BY WILLY LEY, ROCKET EXPERT

PLANS FOR 10-FT. DINGHY BY WILLIAM F. CROSBY • PAGE 84

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NOVEMBER, 1944

VOL. XXXIII NO. 1

On the cover: Navy kodachrome of latest air-sea rescue craft

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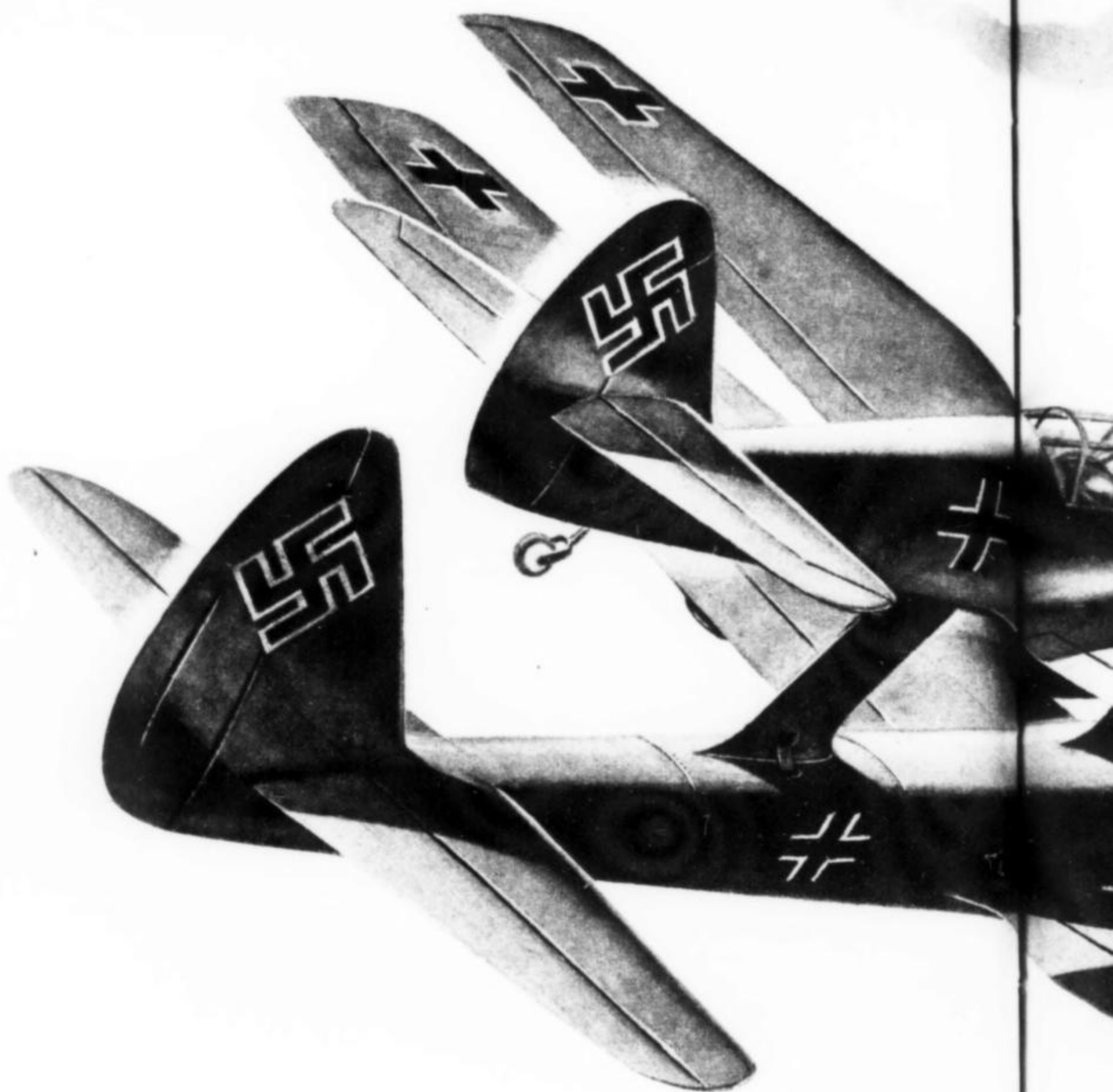
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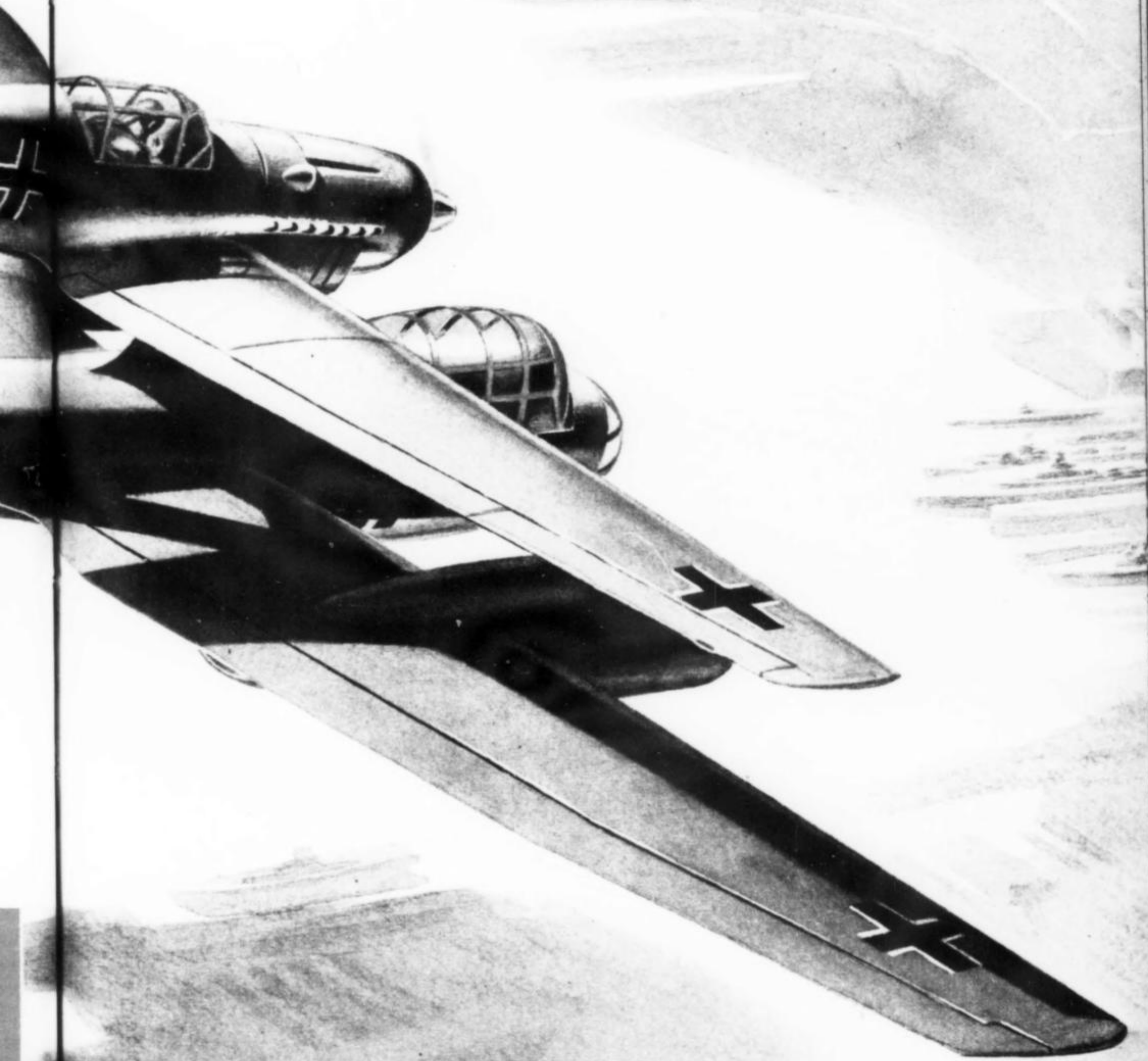
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HEADING FOR THE NORMANDY COAST and Allied shipping is this Nazi tandem consisting of a Messerschmitt Me 109 on top of a pilotless, radio-controlled Junkers Ju 88. Over the target, the Messerschmitt pilot will release the Ju 88 and guide it and its 4, 400 pound bomb load by radio toward

its destination. Nicknamed "Father and Son," it has proved very vulnerable to Allied fighters because of low speed when flying tandem. Relentlessly harried by the Allies, the Nazis in their desperation have resorted to such make-shifts as this and the Siamese-twin-Heinkel 111's shown in the June M.I.

"FATHER AND SON"



MAC RABOY

MECHANIX ILLUSTRATED

MARCH

Now
15¢



Luxury Life Raft—See Page 111

HAS RUSSIA THE ATOM BOMB?

By Hanson W. Baldwin

PILLS THAT INCREASE YOUR INTELLIGENCE

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MARCH, 1948

VOL. XXXIX, No. 5

Cover Photo by Rudy Arnold

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MEMBER AUDIT BUREAU OF CIRCULATIONS

It's the Biggest... It's the Newest... But Palomar Telescope Won't See Far Enough!

BY LOGAN REAVIS

SOME time this year an astronomer will peer for the first time through the largest telescope the world has ever known—will penetrate space to a distance of two billion light years farther than the eye of man has ever explored.

But he won't see far enough.

When the huge 200-inch monacle of science is finally completed after 18 years of work at a cost of \$6,000,000, the astronomer will discover hundreds of millions of stars which man never knew existed. He will discover vast new secrets of the universe. He may find new planets

and perhaps learn whether there is life on those he already knows.

But he won't discover enough and he won't learn enough.

California's "giant eye of Palomar" will be perceptibly dimmed by a no-man's land of dust which hovers above the globe at an average height of seven and one-half miles. This is the layer known as the tropopause in which the temperature ceases to fall with increasing altitude. It lies between the troposphere, the atmospheric layer in which man lives and works, and the stratosphere, and is about five miles thick at the poles and ten miles at the equator.

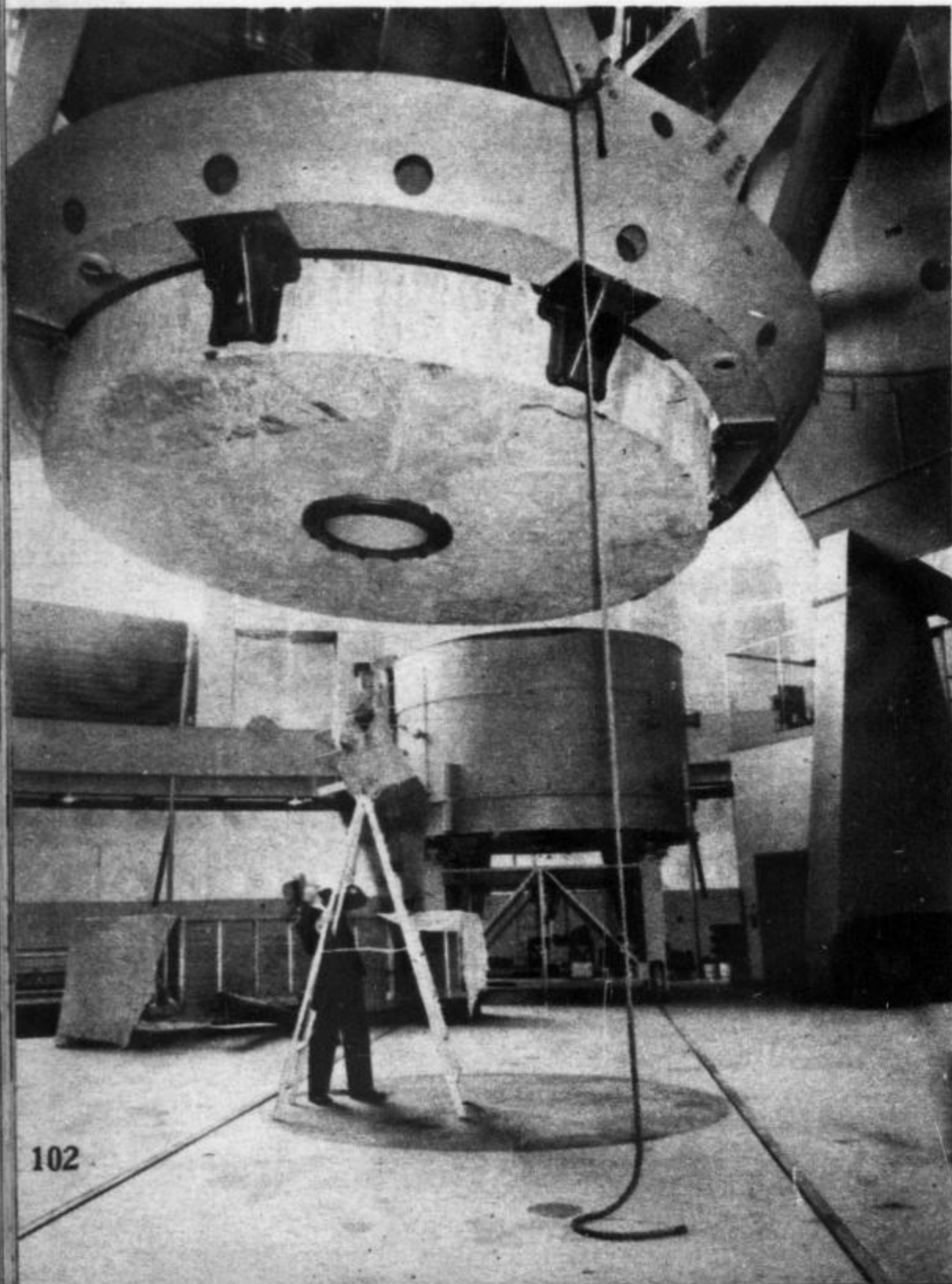
The tropopause is the catch-all basin for dust storms which swirl upward from the arid regions of the earth, for volcanic soot and for sand-storms, all carried upward by thermal currents and deposited there. And there they sit, dust in the giant's eye, distorting celestial images and impeding significant lines of the spectrum.

Scientists have come out with a daring answer. If a land-based telescope is hampered by a layer of dust in the sky, they ask, why not put a telescope above the layer so that crystal-clear vision may be obtained? Why not, in short, put an eye in the sky?

This bold plan has come from the fertile brain of Dr. Lyman Spitzer Jr., associate professor of astrophysics at Yale University. He has taken the theories of several noted physicists and

Lower end of the Mt. Palomar giant, with a 20-ton concrete disk substituting for the mirror. This telescope, big as it is, won't tell scientists all that they would like to know.

Mechanix Illustrated





Declination drive of the great telescope. It is gearing like this which provides the motions by which telescopes automatically follow a star.

engineers and woven them, with his own, into a specific design for an artificial satellite circling the earth. He plans an observatory spinning about in space more than 22,000 miles above the earth's surface, on which astronomical instruments could unravel the mysteries of the skies far more effectively than any post on this planet.

But first would come the problem of transporting the materials into space to construct the platform. How can the scientists get them up there, in view of the fact that more than 600 tons of the types of fuel known today are needed to move just one ton of material into space?

The answer symbolizes the age in which this startling project may become a reality: atomic energy, the only energy source powerful enough for that job.

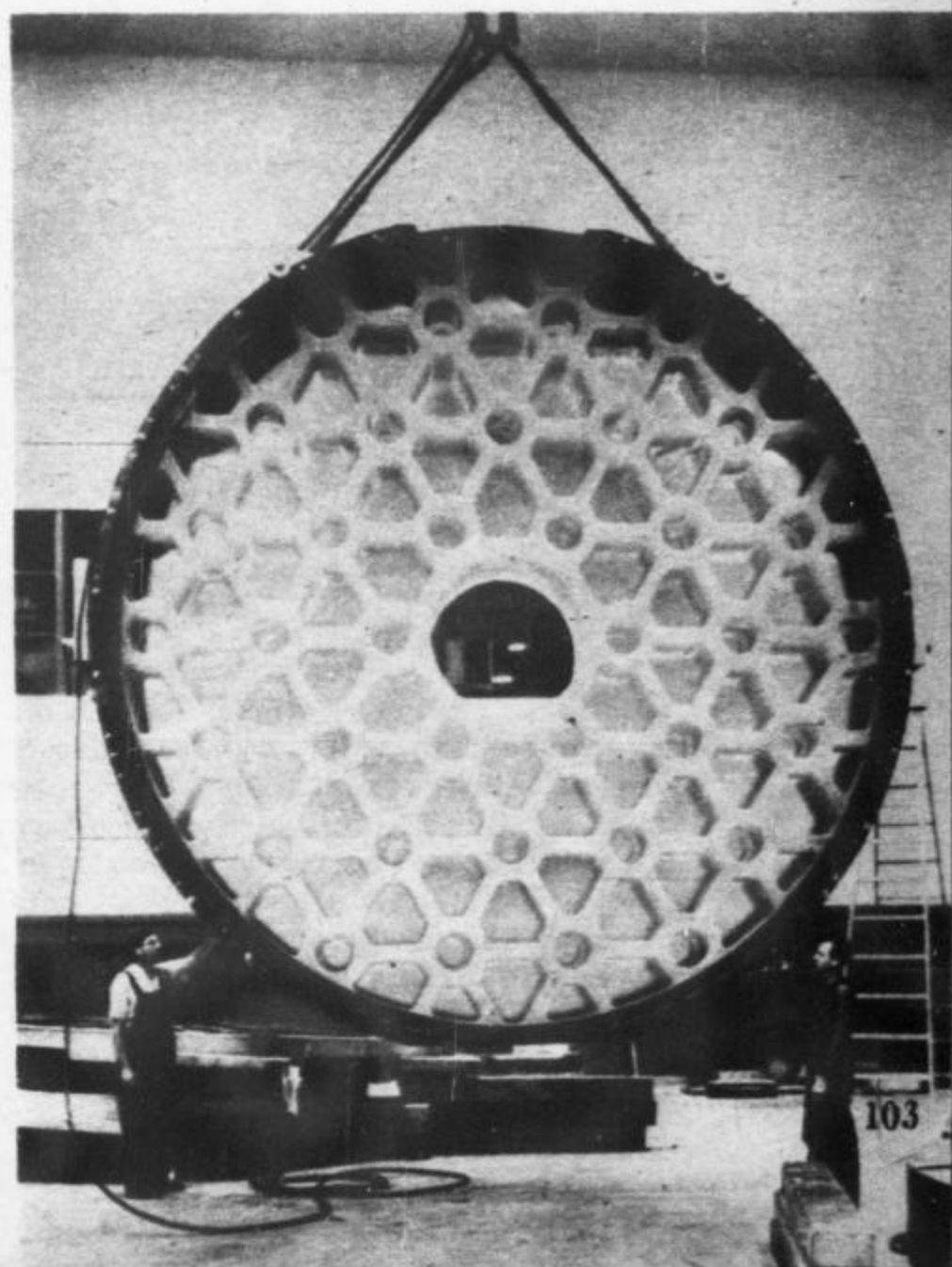
Atomic energy would be the gasoline and—another scientific miracle—rockets

would be the moving vans! Rockets, carefully insulated from suspected high temperatures in the upper realm of the stratosphere, would tow the prefabricated parts upward for assembly "on the spot" in the stratosphere.

— Let's have a [Continued on page 162]

Palomar's 200-inch pyrex mirror is almost ready for its job as earth's keenest space-probing eye—but it won't be so keen. Dust, haze and temperature changes will cover it with a permanent veil. Only a telescope in space—on a man-made satellite or the moon—will give ultimate sight.

March, 1948

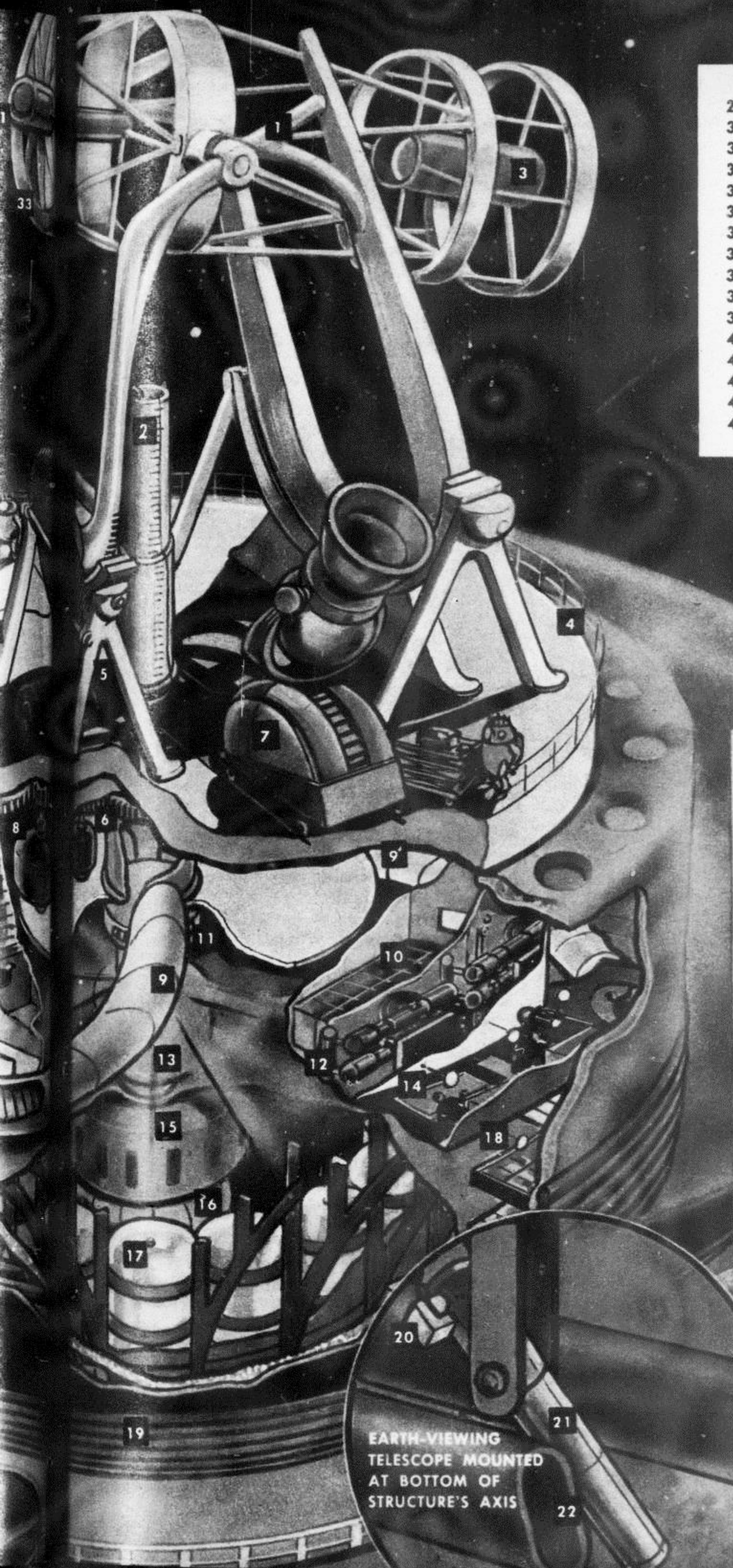


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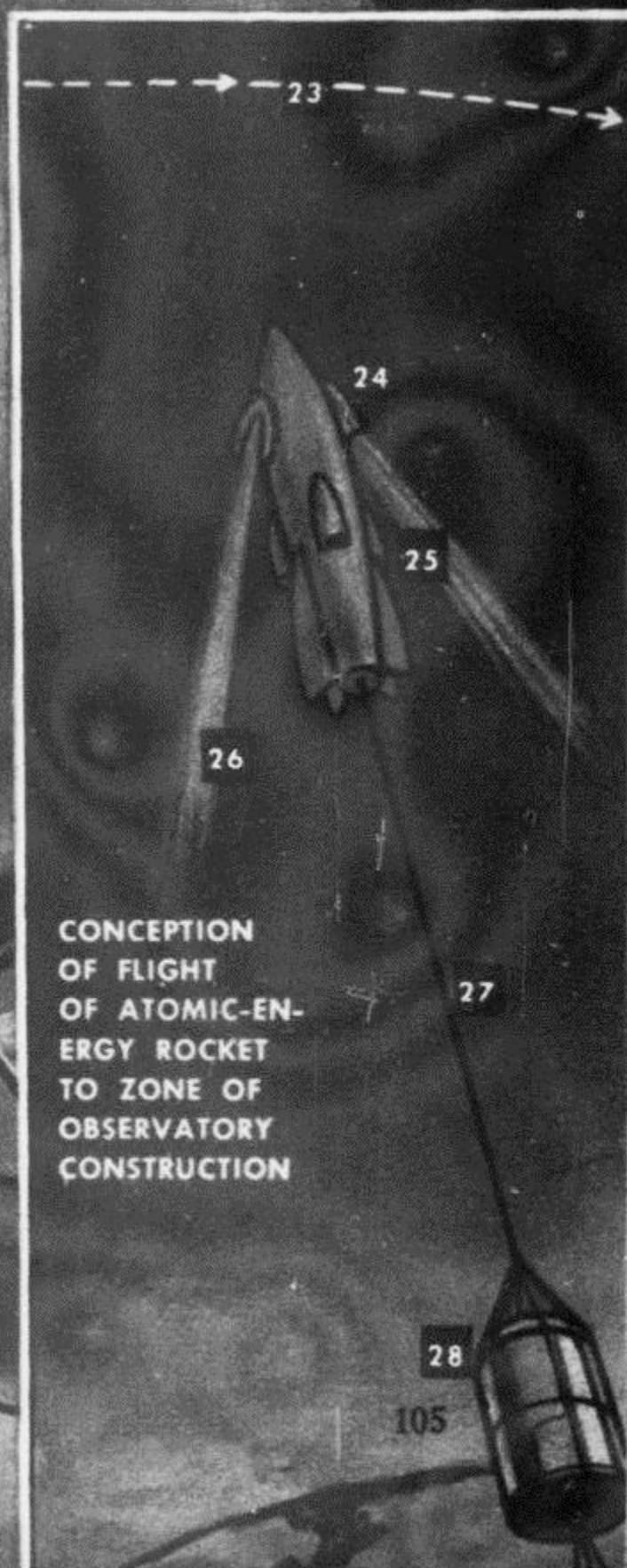
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| 5. WORM GEAR SYSTEM | 19. STEAM-CONDENSING PIPES |
| 6. MOTOR OPERATING LOCK UNIT | 20. ICONOSCOPE |
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| 13. MOTOR | 27. TOW-LINE |
| 14. DARK ROOM | 28. MEN AND MATERIALS BEING TOWED IN CARRIER |



Artist's conception of coming "Eye in the Sky," based on the projections of foremost scientists. It's a man-made satellite, constructed on the "spot" from pre-fabricated materials rocketed up from earth. It spins, maintaining an artificial gravity through centrifugal force. Dominating the turntable is a great 200-inch reflecting telescope; lower platform holds a refracting telescope for observation of earth. All instruments stand exposed to the frigid interstellar void. Men working outside wear pressure suits.



- 29. RADIO TRANSMITTER
- 30. RADIO ANTENNA
- 31. CASSEGRAIN CAGE
- 32. SOLAR OBSERVATION TOWER
- 33. 200-IN. MIRROR
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- 43. STEAM PIPES
- 44. ROCKET NOZZLES



CONCEPTION
OF FLIGHT
OF ATOMIC-EN-
ERGY ROCKET
TO ZONE OF
OBSERVATORY
CONSTRUCTION

EARTH-VIEWING
TELESCOPE MOUNTED
AT BOTTOM OF
STRUCTURE'S AXIS

AVIATION • INVENTIONS • HOBBIES

10¢ MECHANIX ILLUSTRATED

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A FAWCETT PUBLICATION



AMERICA'S BIGGEST PURSUIT PLANE, THE P-47 "THUNDERBOLT"
BUILD A FLYING MODEL • SEE PAGE 108

"WE KEPT THE TIGERS FLYING"

By Pilot James Cross, of the A. V. G.

NEWSSTAND CIRCULATION OVER 300,000

MECHANIX ILLUSTRATED

W. H. FAWCETT, JR., President

Editors: Roland Cueva Bill Williams

Associate Editors: George Daniels, Aviation; Norman C. Lipton, Photography; Charles D. Bonsted, News; Shirley Cutter, Production

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SPECIAL FEATURES

On the cover: The United States' biggest pursuit plane, the Army's P-47, made by Republic. Boasting speed better than 400 m.p.h. from its 2,000-h.p. engine, it's literally a "Thunderbolt" to blast the Axis. Rudy Arnold kodachrome.

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59 Pages of Photography and How-to-Builds	
	starting on 95

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Noted astronomer, Assistant Curator of the Hayden Planetarium

NEXT MONTH

Could you be an airplane pilot? How is your sense of balance? How steady are your nerves? How is your apparatus of "sense motion"? Can you pass the eye accommodation test? How could you stand high altitude? MECHANIX ILLUSTRATED will tell you exactly how to test yourself in the same manner that all candidates for the Army Air Force are tested, in an intriguing picture story in the January issue. These are tests that anyone can make as part of an interesting parlor game, without special equipment. Be sure to read it and take the tests!

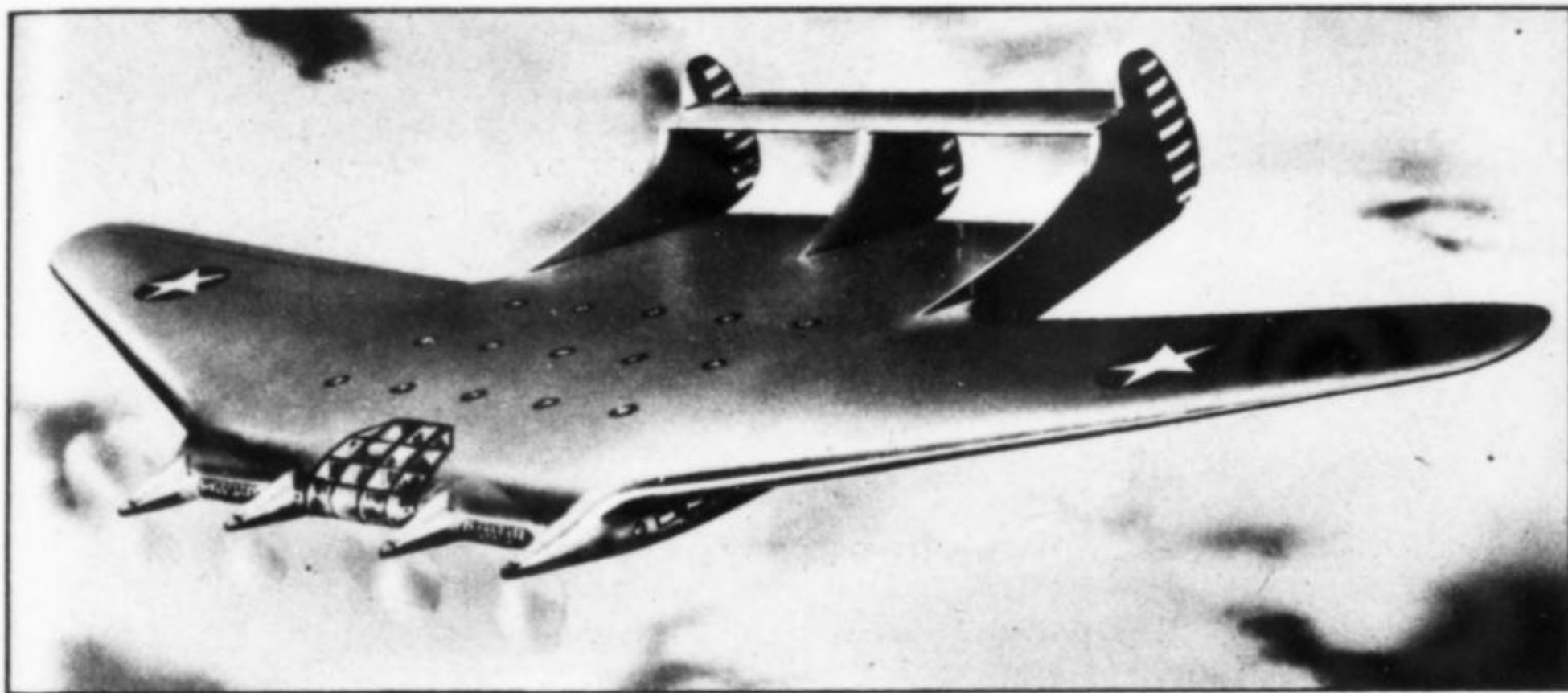


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NEWS OF SCIENCE AND MECHANICS

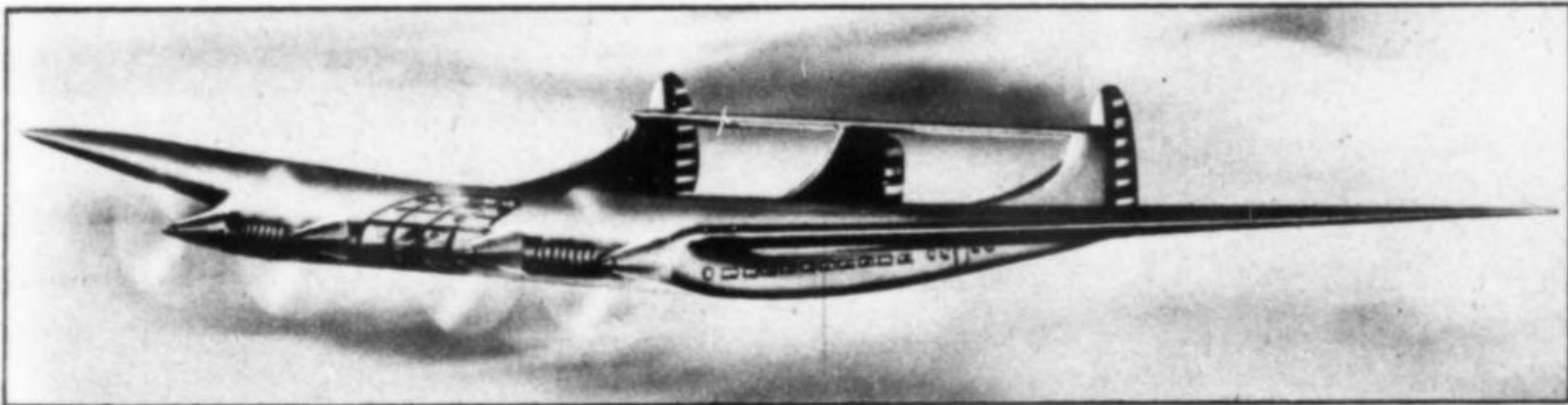
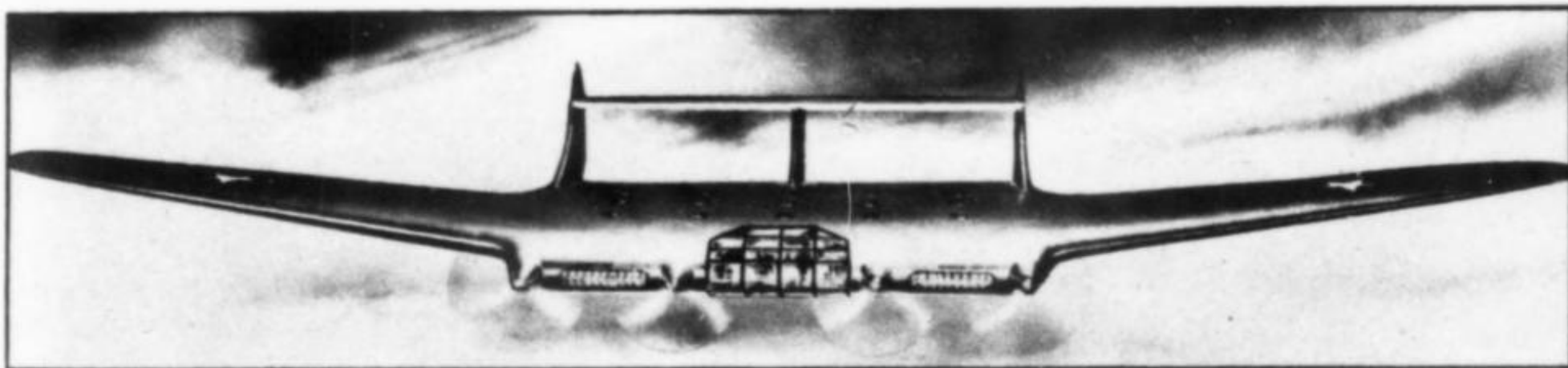
SUPER FLYING-WING
TOY GOES TO WORK
GARAGE RAID SHELTER
NAILS REJUVENATED



Flying Wing To Carry 25 Tons 6,000 Miles

PUBLISHED here for the first time are drawings of a new super-transport, flying-wing type, designed by Vincent Burnelli. Specifications: wing span, 192 ft.; length, 93 ft.; weight empty, 52 tons; maximum speed,

320 m. p. h., but it will land empty as slowly as a sport plane does; range, 3,500 miles with 35 tons cargo or 300 passengers; four 4,000 h. p. engines. It's automatically stable. Total cargo volume equals eight box-cars!





NEWS OF MODERN WARFARE

Kaiser's Cargo Plane

THIS artist's conception depicts the Kaiser-Hughes super-cargo plane for transporting 60 tons of freight 2,000 miles, or 20 tons 6,000 miles, to far-flung battle fronts and to sub-blockaded allies. The twin-hulled seaplane, about twice the size of the biggest airplanes previously built, will be powered by seven 2,000-horsepower engines. Messrs. Kaiser and Hughes are now undertaking the first of 5,000 of the craft in former ship-yards.

Mammy!

IF THEY'VE any sense, Japs and Nazis will drop to their knees and yell "Mammy!" when they see a United States soldier in blackface like this one coming. He means business, and no mistake! The burnt-cork make-up, strictly from Dixie, and green-paint daubed uniform help him sneak up on the enemy. The mean-looking machete and tommy-gun explain why Sgt. Kenneth Elder is called a tank-destroyer.



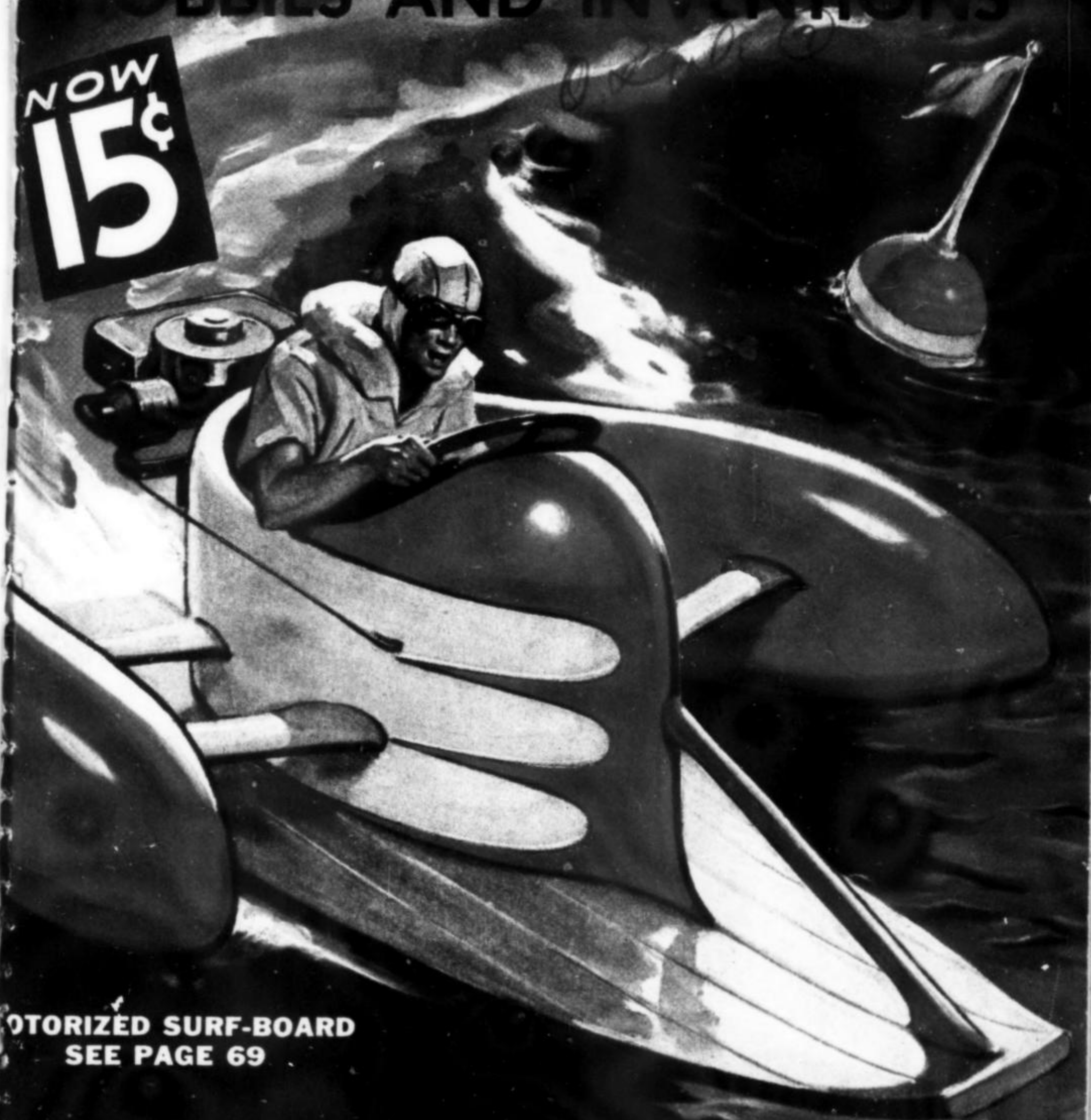
WIN A SOAPBOX RACING CAR

July

MODERN MECHANIX

HOBBIES AND INVENTIONS

NOW
15¢



MOTORIZED SURF-BOARD
SEE PAGE 69

FOUND! KING SOLOMON'S GOLD MINES—

PRICE
15 CENTS

SAME PRICE
IN CANADA

MODERN MECHANIX

HOBBIES & INVENTIONS

JULY,
1936

Volume XVI
Number 3

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AUGUST! Lowell Thomas Writes of Reckless Pilots



A new thrill for Modern Mechanix readers! Lowell Thomas, noted adventurer, writer and radio commentator, tells how the most courageous of fliers risk their lives in taking new and untried planes aloft. Watch for the title—"Test Pilots—Daring Challengers of Death." Don't fail to read it in the next issue.

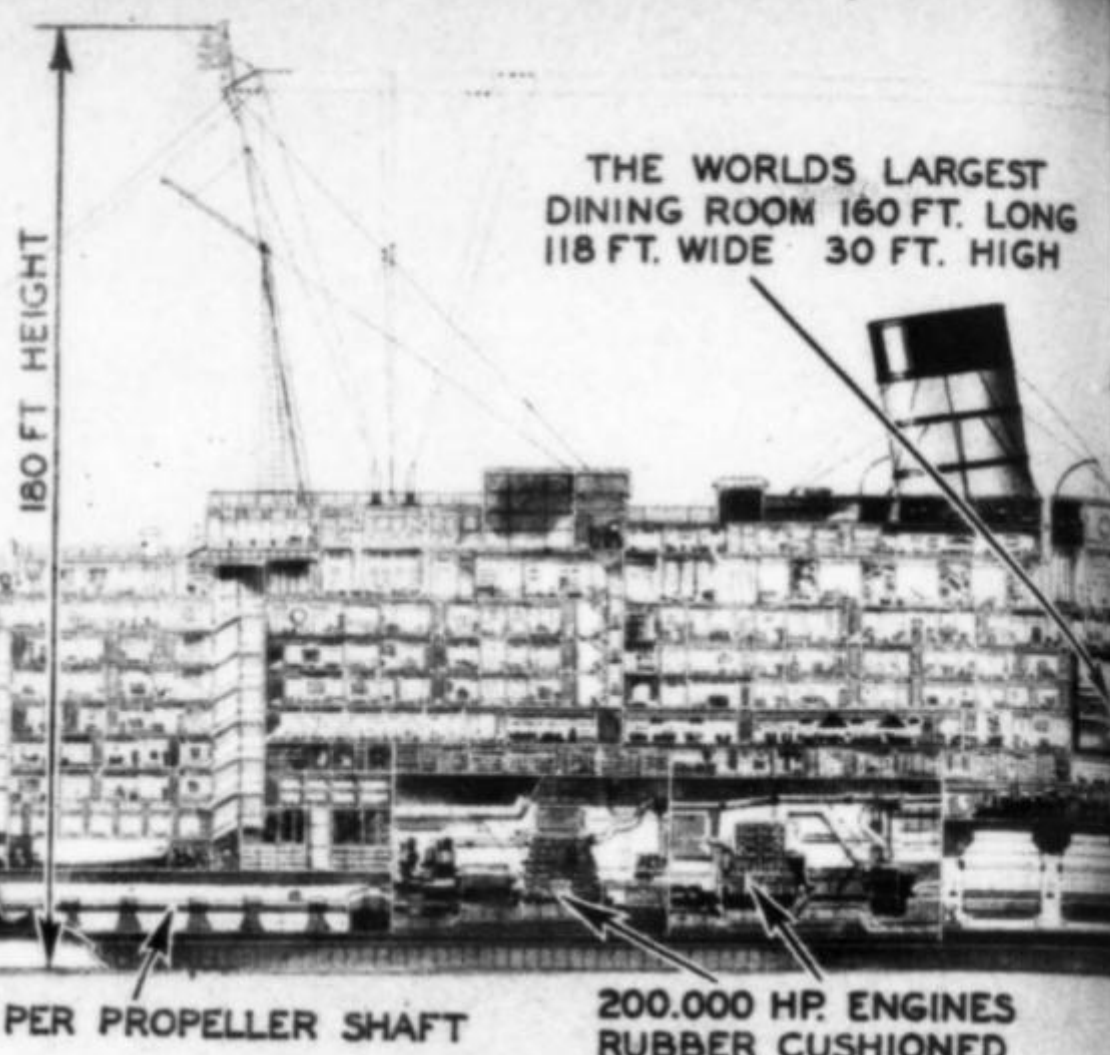
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ACROSS THE ATLANTIC IN 4 DAYS



THE WORLD'S LARGEST DINING ROOM 160 FT. LONG 118 FT. WIDE 30 FT. HIGH

1004 FT. W.L.

RUDDER WEIGHT 140 TONS
EACH PROPELLER 35 TONS

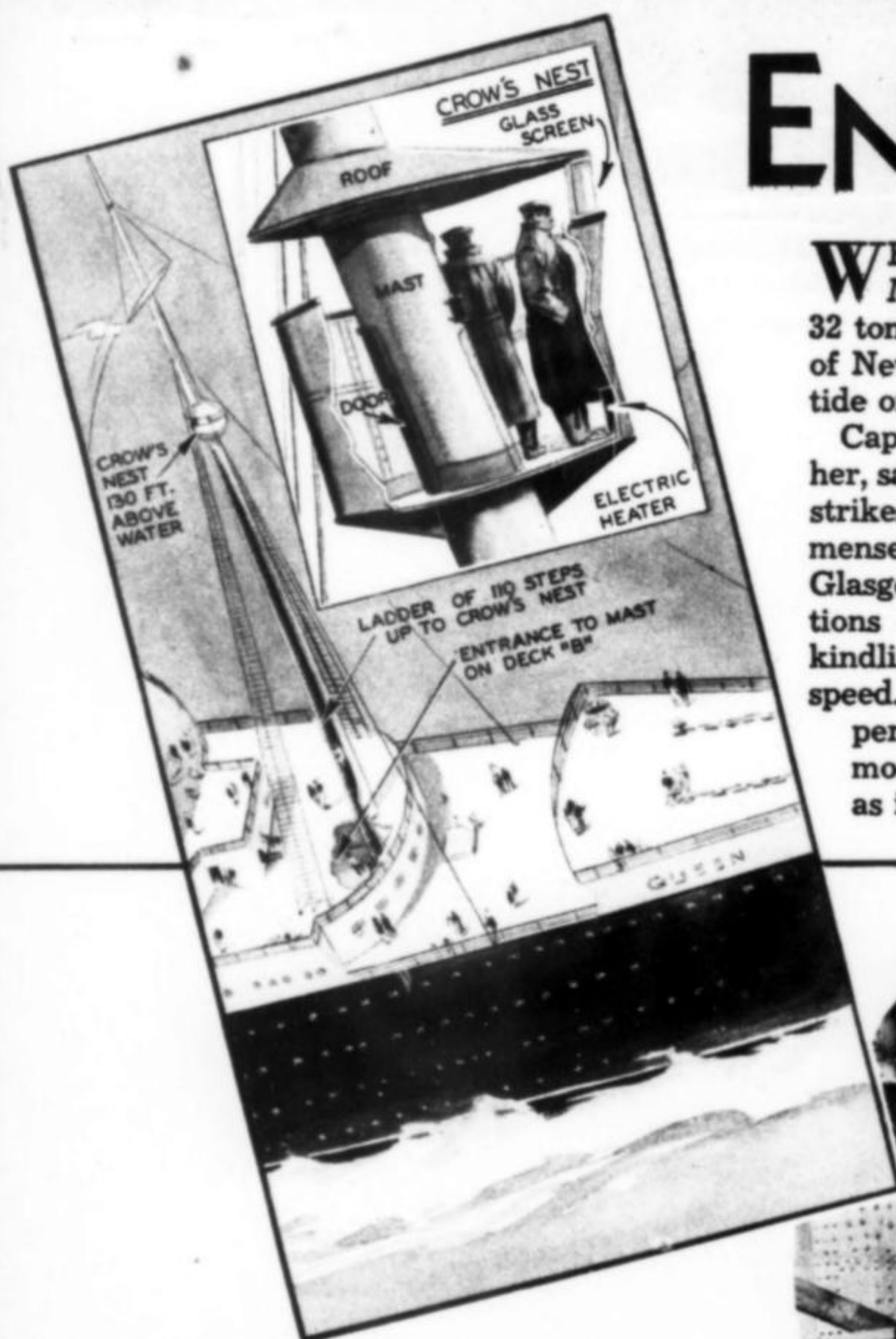
50 000 HP. PER PROPELLER SHAFT

200,000 HP. ENGINES RUBBER CUSHIONED

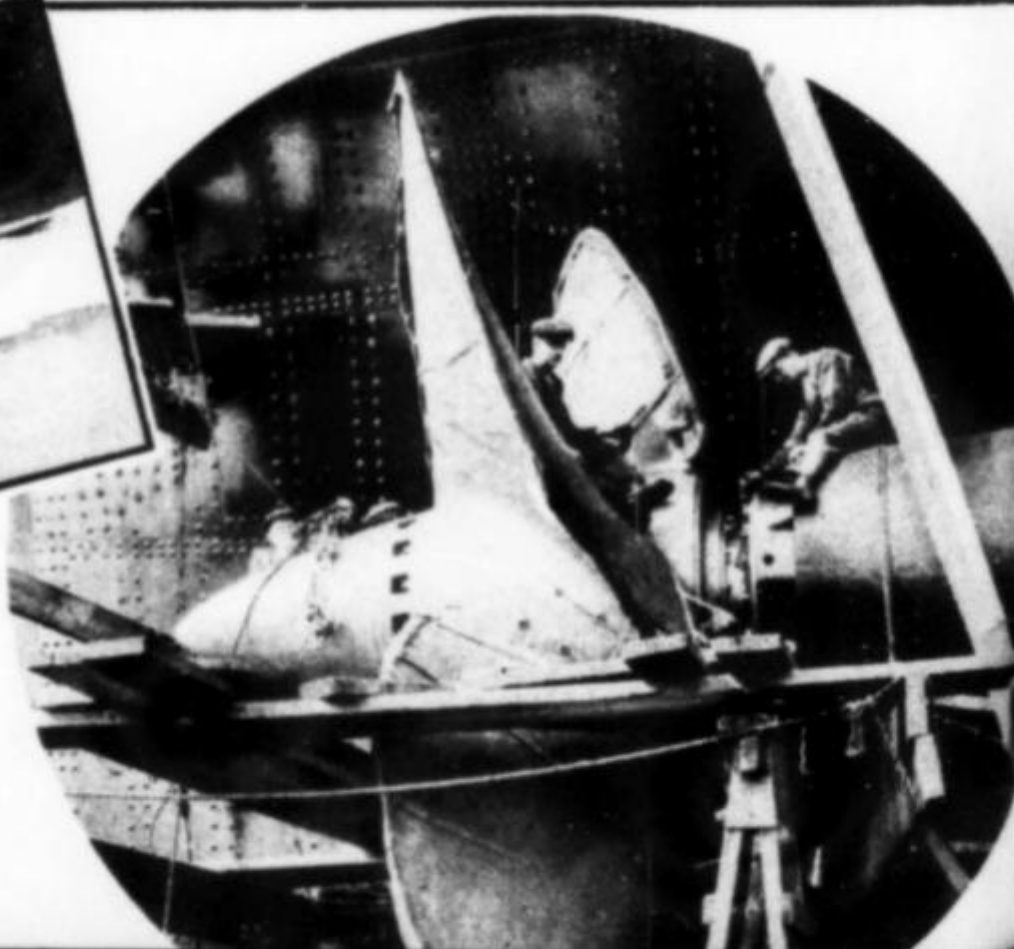
ENGLAND'S

WHEN England's giant liner, the *Queen Mary* drops her anchors at quarantine, 32 tons of steel will grapple the mud bottom of New York Bay and swing her against the tide on 145 tons of massive steel chain.

Captain Sir Edgar Britton, commanding her, says she is a "good sound job." But what strikes one most is the loveliness of her immense presence. For she is a great lady, Glasgow born and bred to follow the traditions of her ancestry—safety, comfort, sea-kindliness, regular arrival and departure, and speed. As speed queen hostess to 3,500 persons, passengers and crew, she has the most powerful engines afloat, cushioned as in an automobile, with the engine room



To reach the crow's nest (above), the lookouts must climb 110 iron rungs inside the hollow steel foremast. For the first time in any ship the crow's nest is elaborately fitted with modern devices. There are telephonic connections to the bridge below, and in addition to the glass weather screens, electric heaters keep the lookouts warm in winter.



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EACH FUNNEL LARGER IN DIAMETER
THAN HUDSON TUNNEL

CROW'S NEST
ELECTRICALLY
HEATED

COMPLETE
DUPLICATION OF
STEERING GEAR

FREIGHT CARS TO
HAUL HER WEIGHT

WEIGHS AS
MUCH AS
12 MOTOR CAR

70 FT

1004 FT.
WATER LINE

4-MAIN TURBINES CAN BE
OPERATED INDEPENDENTLY

SPACE BETWEEN INNER AND OUTER
BOTTOMS WILL PERMIT MAN TO WALK ERECT

WONDER GIANT

PUTS TO SEA

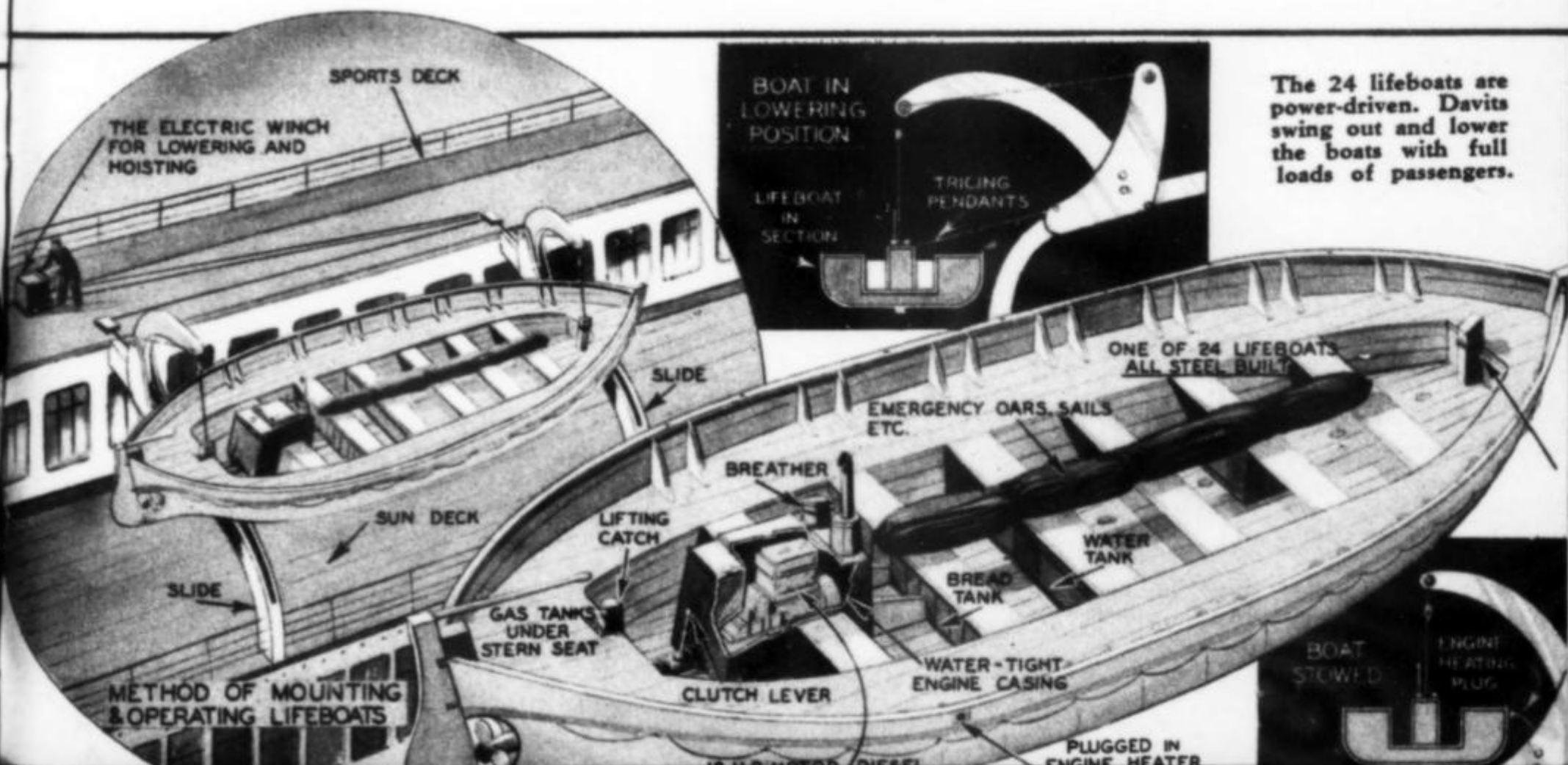
"sprung" to eliminate the least vibration. Her single reduction geared turbines develop 200,000 horsepower and operate four 35-ton propellers. She is 1,018 feet long, 118 feet wide, 135 feet high from her keel to the top of her superstructure, and she displaces 83,000 tons of sea water.

Should her double hull, in which a man can walk erect, be punctured, any one or all of 37 watertight bulkheads would close. Her 24 all-steel unsinkable lifeboats carry 145 passengers each. There are 30,000 electric lights to give her illumination, 50 miles of plumbing, 21 elevators, special garages, a shopping center, gymnasium, cafes,

lounges and even a kennel deck for dogs.

Strength, sea-kindliness and ease of movement through rough water are built into *Queen Mary's* knife-edge bow and all underwater "streamlining," to keep her steady on the rough North Atlantic and stifle the pounding of the tremendous following seas of the eastern passage.

And if you tune in Singing Sam's deep bass final note of "Asleep In The Deep," you will have an excellent idea of how the ship's sirens sound. The deep, soft, far-carrying



The 24 lifeboats are power-driven. Davits swing out and lower the boats with full loads of passengers.

The Queen Mary

COMES TO AMERICA



To the accompaniment of tooting whistles and the cheers of thousands of spectators, the *Queen Mary* started on her test trip. The complete story of this amazing liner starts on page 46

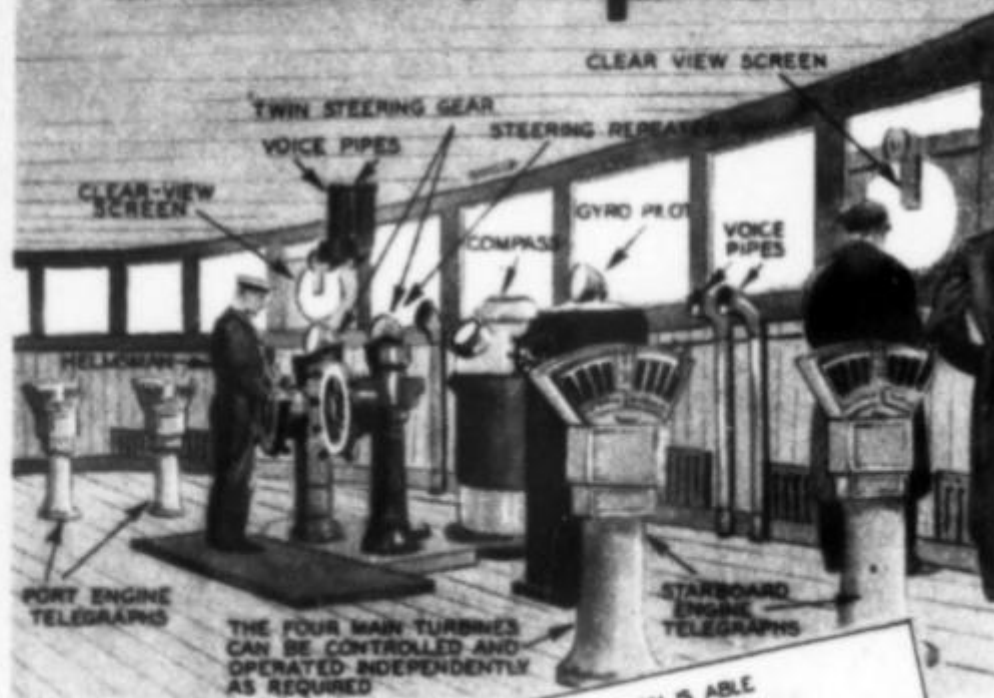
NEW GERMAN
AIRSHIP
D-LZ-129

Comparison of the largest
dirigible and greatest
ship in passenger space.

EXTENT OF
PASSENGER
ACCOMMODATION

QUEEN MARY

Great Ship Is ROBOTS' Paradise

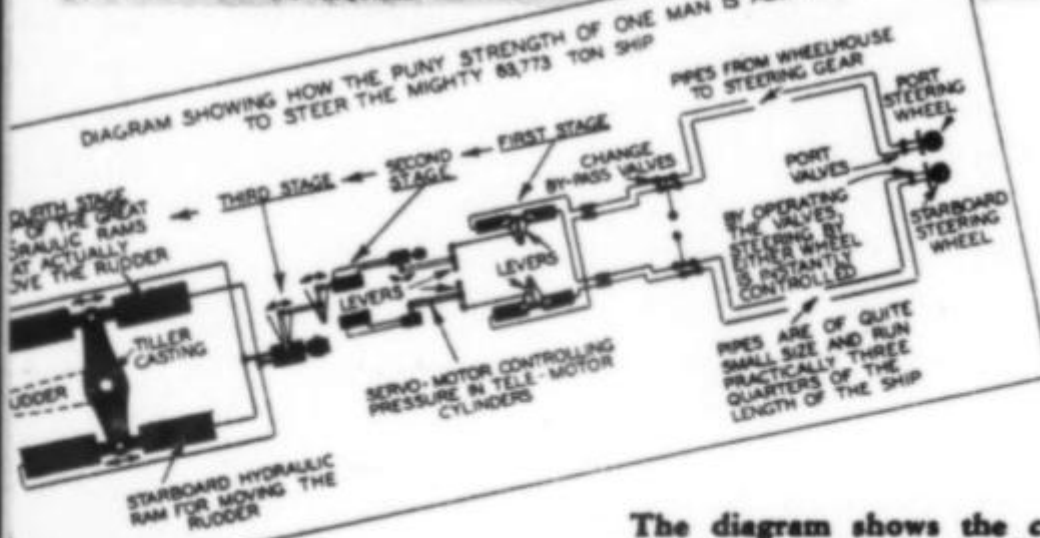


tone can be clearly heard for ten miles, yet its mellow "A" depth will not disturb the passengers.

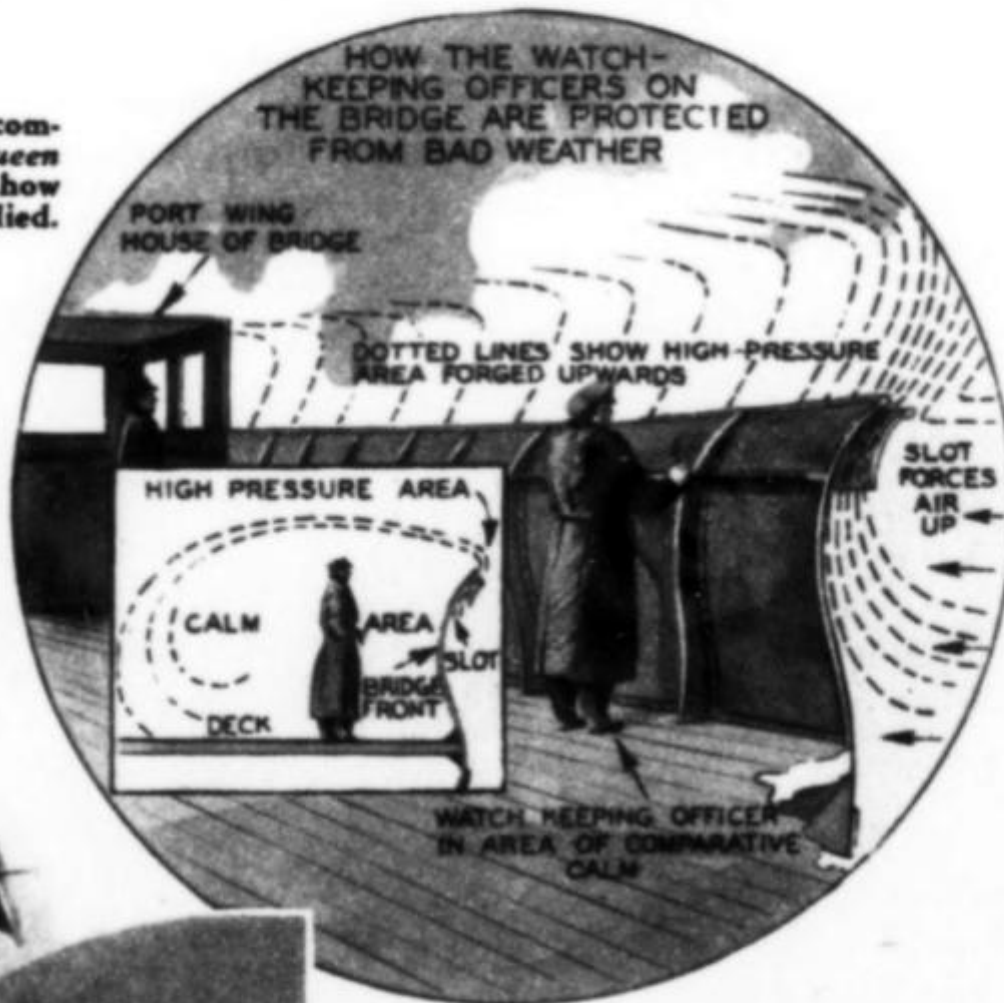
The great restaurant on "C-Deck" accommodates 815 diners and is the largest room of its kind ever built into a ship. It is 160 feet long, runs the full width of the beam, and towers up through three decks. In the vast adjoining kitchens, among other labor-saving devices, is Robot Molly, the mechanical dishwasher. She can wash, rinse, polish and sterilize thousands of dishes an hour, but never break even the most fragile china cup. And there are 200,000 pieces of china and 100,000 items of tableware to keep clean.

Diners in this restaurant can look up at a painting of the North Atlantic and see a miniature Queen Mary duplicating the course of the mother ship. Thus the exact latitude

[Continued on page 144]



The diagram shows the complete duplication of Queen Mary's steering gear and how the rudder power is applied.



The design of the wind screen sends an invisible tent of wind over bridge officers.

MECHANIX ILLUSTRATED

AUGUST
15c

A FAWCETT MAGAZINE



The CONESTOGA
New Stainless Steel Plane
Carries Fire Truck and Jeep



SPECIAL SECTION **SKY GIANTS OF THE FUTURE** SEE PAGE 64

MECHANIX ILLUSTRATED

Title registered U. S. Patent Office

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Gilbert Paust, Crafts & Hobbies; Ruth Phillipps, Production

AUGUST 1944

VOL. XXXII NO. 4

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Explorer and Assistant Curator of
the American Museum of
Natural History

LT. COMDR. BOB BARTLETT

U S Navy

On the cover: The "Conesfoga"—stainless steel sky freighter

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TOMORROW'S AIR TRANSPORTS



The Miles "X"—British bid for postwar air. Range—3,450 miles. To carry 50 passengers and crew of five at 350 m.p.h. MI painting by Fred Ripperda.

Science in Color

What postwar airplanes will make
this world your travel oyster?

THIS decade, in the most literal sense, is up in the air. Witness this single eloquent statistic: As recently as 1939, the dollar value of aircraft production placed it 44th among American industries. In 1943 it was first. There, in a nutshell, is the phenomenon of the Forties.

But the role of aircraft in warfare, and even more in the peace to come, is far from being fully defined. It was only this year that the

real air war got under way, with the great pre-invasion air offensive against Germany, the smashing raids on the Marshalls, Truk and the Marianas by the greatest aircraft carrier forces ever assembled. "The face of war and the nature of living," says Hanson Baldwin, "are just beginning to be altered by air power in its various forms." And only a few months ago Brig. Gen. Edgar P. Sorensen, former Assistant Chief of Air Staff for



The "China Clipper"—Pan American's famous B314 transoceanic flying boat built by Boeing. A prewar transport.

Intelligence, stated that "Air power is now possibly little more advanced than was sea power at the time Phoenician traders were arming their galleys for use in raiding other shores."

In short, the biggest things in the air are yet to come. In the words of one observer, "The tactics and techniques of the third dimension are still in almost daily flux." As they approach sharper definition, we shall find our ways of life profoundly altered.

Already our concept of the globe has shifted radically. The geography-book picture of the earth as a sphere 25,000 miles round is one thing. A world so greatly shrunk that no spot on its surface is more than 60 air hours from your home town is something else again. Zambesi, Patagonia, Bagdad, Irkutsk—all the legendary places are now within easy reach, closer than many summer resorts used to be. Pan-American Airways

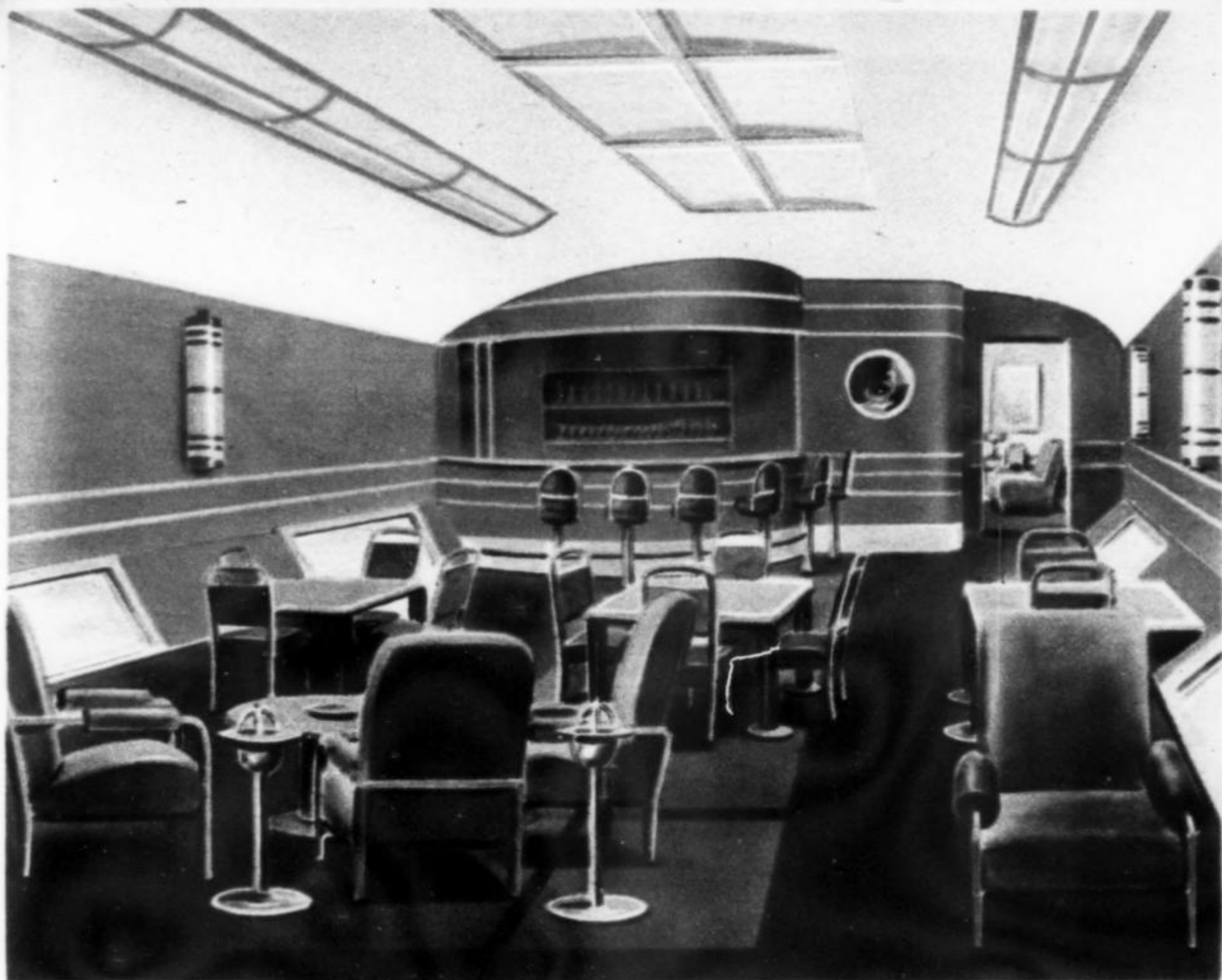
isn't kidding when it advertises a week-end jaunt to Paris as soon as the war ends, to compete with your old-fashioned excursion to the mountains.

And our old ideas of directions are being thrown on the junkpile. There was a time when you went west from New York to China, east from New York to Europe. Today, for both, you go north—the shortest, fastest way.

The pre-war Clipper route to China, for example, followed the old sea route—from San Francisco to Hawaii, then on to Midway, Guam and Hongkong. Today the air route cuts over Alaska, Siberia, the Gobi Desert and down into the heart of China. It's 4,000 miles shorter that way. The sea route from New York to Bombay, via Gibraltar and the Suez Canal, was 9,500 miles. Now, by air, with stopping points at Reykjavik, Moscow and Teheran, it's 7,800 miles. The sea

The Boeing 307 "Stratoliner"—the great four-engine prewar plane that operated at 14,000-20,000 ft. TWA's best.





Above, the lounge of the British eight-engine Miles, complete with easy chairs, game tables and bar, will put to shame almost anything earthbound streamliners can offer. The cockpit (below) is the last word in visibility and spaciousness for transport pilots. It's practically a complete Waldorf-Astoria with wings!



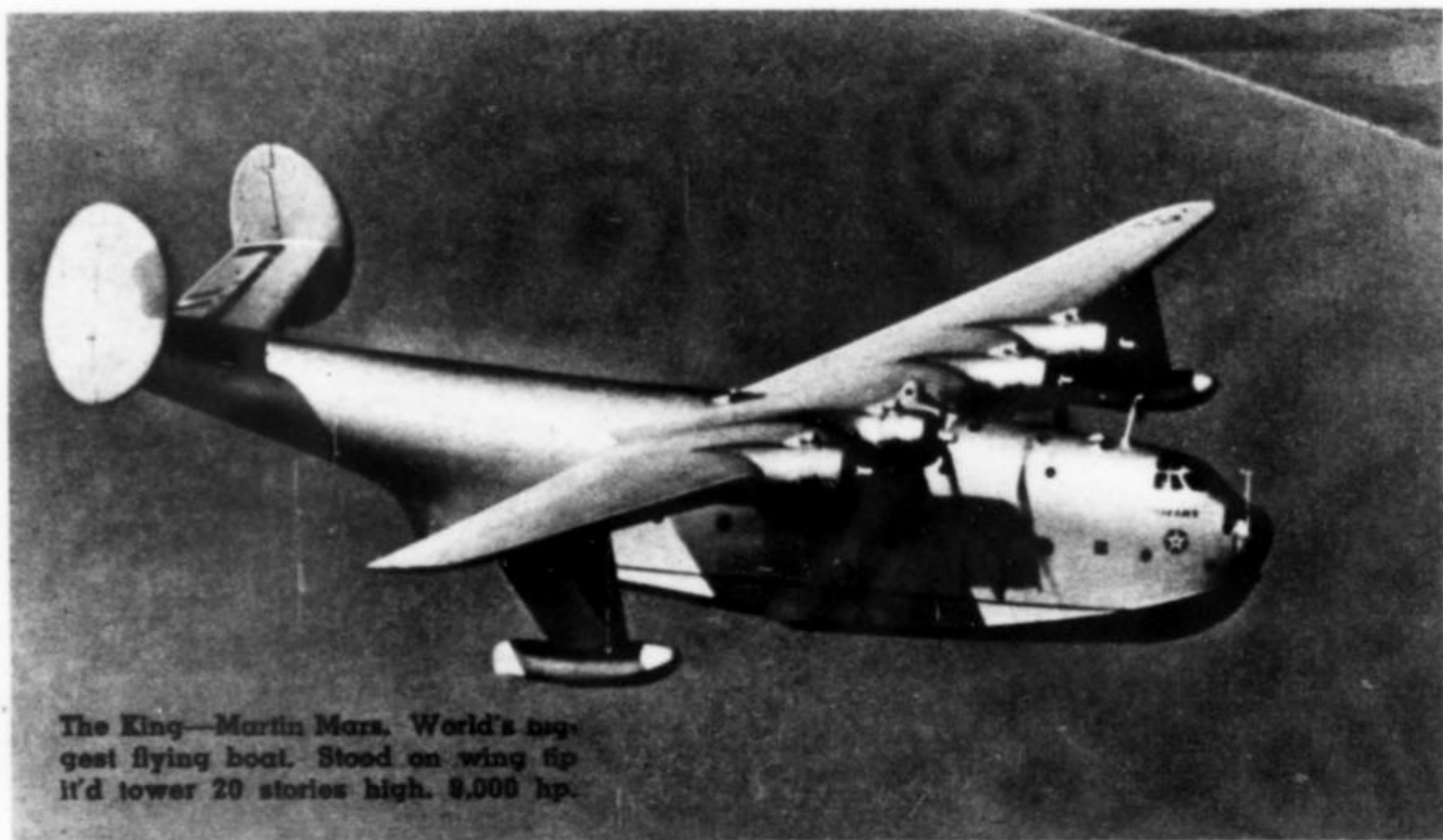


The latest—Lockheed Constellation. Howard Hughes crossed the country in this baby in just 418 minutes.

journey took three weeks. The flight takes 39 hours.

Similarly, by air Moscow is closer to Chicago than to New York. From Kiska it's

almost the same distance to both Detroit and San Diego. Seattle to Calcutta is 12,000 miles by sea, as against 7,200 miles by air. And already, as the headlines keep telling us, air-men are nonchalantly hopping the Atlantic in a mere 400 minutes by Flying Fortress.



The King—Martin Mars. World's biggest flying boat. Stood on wing tip it'd tower 20 stories high. 8,000 hp.



Aerial work horses. Ex-airliner C-47 Skytrain. This Douglass freight hauler was grabbed for war duties.

Our old mercator maps, designed for earth-bound globe-trotters, pictured the world as the flat projection of a cylinder, not a sphere. They were a product of the days of ocean travel, good chiefly for east-west navigation and accurate only at the equator.

As you move away from the equator the distortion becomes so great that little Greenland, for instance, looms up large enough to dwarf all North America. [Continued on page 142]



And the greater Skymaster, C-54, developed by a pool of air lines, was ATC's big four-engine break.

A HELICOPTER YOU CAN HANDLE



Bell's new helicopter is a two-place cabin craft with a two-bladed rotor and an anti-torque tail propeller.

by C. B. F. Macauley

Director of Aeronautical Research, Dohner & Lippincott

Arthur Young fooled around with model helicopters for 15 years. One of his toys may be your postwar flivver.

THE newest helicopter to be unveiled to the American public is Bell Aircraft Corporation's sleek two-place design. I had the privilege of being the first technical writer to be shown the remarkable developments which have been accomplished in the Garden-ville helicopter laboratory, near Buffalo, N. Y.

Like most outstanding achievements, this is the story of a man and a purpose. The man is Arthur Middleton Young, designer of the craft. He has been working steadily and persistently at the problems of helicopter flight for 15 years. To his experience there was added a few years ago the vision and resourcefulness of Larry Bell, one of the world's outstanding producers of fighter planes.

The extent to which Young is wrapped up in his idea is exemplified by the following incident. At a dinner in a little Italian restaurant in Buffalo, with Young, his charming wife, Priscilla, and a few friends, we were

suddenly startled by a miniature helicopter whirling gayly down to the center of the table. Arthur had fashioned it from a piece of the menu and a paper clip.

Priscilla Young was not very surprised, however. She explained that the whole affair was so overwhelming she hadn't any capacity for surprise left. It seems that after graduation and marriage, Arthur Young didn't go to work every day or pursue a career or profession like most men. He flatly announced that he was inventing a practical helicopter.

The Youngs lived on a farm at Paoli, Pa., not far from Philadelphia. He had a fairly elaborate workshop in the barn and on good days he'd chase the cows from a corner of the pasture and fly model helicopters. Priscilla admits that she and some of their friends thought at times it was rather an odd way for a grown man to act—playing with toy flying machines day after day, year in and year out—



Helicopter on the left is the new Bell Aircraft model; on the right our artist has pictured an older type. Because of a stabilizing bar, which acts as an artificial horizon, the rotor on Bell's ship tends to remain horizontal—it doesn't tip no matter how much the cabin is buffeted by gusts of wind.

but evidently he could afford it and he had an engaging personality so they guessed it was all right if that was all he wanted to accomplish in life.

Young wasn't playing, though. He avoided some of the costly mistakes which have plagued his predecessors and contemporaries. He did not risk effort or money in building a full-scale model until he was confident he had most of the answers. He had tiny rotor blades made by the hundreds; whenever a model met with disaster, he simply fastened on a new set of blades and continued his experiments. Finally, he discovered a means of achieving stability. This made possible the extensive flying of scale models by remote control. By twisting a couple of knobs corresponding to flight and power controls he caused his models to take off, ascend, descend, fly horizontally, reverse direction and land.

A few years ago Bell learned of Young's accomplishments. Laurence D. Bell has been in the aviation business for a long time and has a reputation for being a bold innovator

in aircraft design and production techniques. So, while the rest of the industry was for the most part pooh-poohing the possibilities of the helicopter for decades to come, he quietly provided Young with the necessary facilities and, in effect, told him to "deliver the goods."

Young, born in Paris November 3, 1905, is the son of Charles Morris Young and the former Eliza Middleton Coxe, both American artists of distinction. He is the only one in the family with a mechanically inventive mind. He is not the secretive or "lone-wolf" type of inventor. As a matter of fact, he shares credit for the present accomplishment with Bartram Kelly, friend and associate of long years' standing who is now with him at Bell Aircraft.

The working relationship between the two men is interesting. Young throws out an idea for some improvement or new device. Kelly will figure for hours, sometimes days, working the proposition out mathematically in an effort to predict its chances for success.

Frequently Kelly reports, "No, it won't work." Occasionally, Young persists in a practical test of his idea anyway. If he fails, Kelly enjoys a huge laugh. But if, as sometimes happens, Young's experiment proves successful in spite of a negative mathematical prediction, he gleefully rips Kelly for days.

The first full-scale machine was completed early in 1943. It and later models have been undergoing flight tests steadily ever since. They are two-place types with pilot and passenger sitting side-by-side. Like several other designs now flying, it has a big main rotor atop the cabin and a small auxiliary rotor at the end of a long, slender tail.

Unlike most others, however, the main rotor has two blades instead of three. The blades are long, narrow and rigid. But, more important, the rotor's position in space is governed, not by the position of the mast to which it is attached, but by a stabilizing bar coupled to it which acts as an artificial horizon. The cabin is suspended beneath the rotor much like a plumb bob.

In other words, the revolving rotor tends to remain horizontal and does not tip if the cabin of the machine encounters gusts of wind. This increases the stability of the craft and makes for greater ease of control.

In current models a small Franklin air-cooled engine is mounted vertically in the center of the machine directly under the rotor mast. The tail rotor produces a thrust which compensates for the tendency of the cabin to rotate in a direction

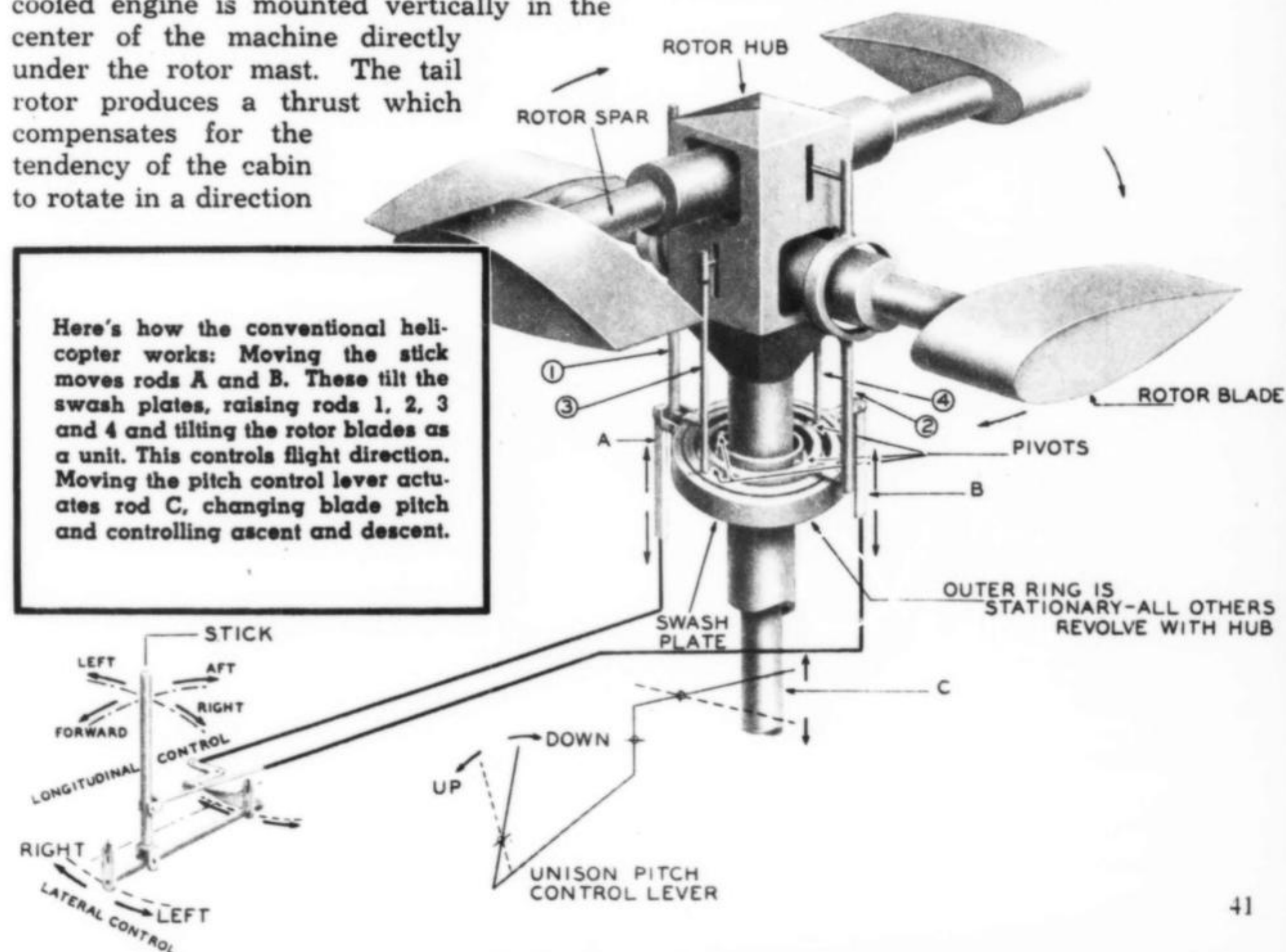
opposite to the rotation of the blades due to the tongue.

The interior of the cabin, with its controls and instruments, is relatively simple. There are just two controls, a stick between the pilot's legs which governs the direction of flight, and a lever to the left of the instrument panel. The lever is raised to ascend, lowered to descend. Moving it to the right or left alters the pitch of the tail rotor so the direction in which the cabin points will coincide with the horizontal direction, or flight path, of the main rotor. Engine power is regulated by twisting the hand-grip on top of the stick.

Now for the \$64 question—When can I buy one?

The Bell helicopters, at their present stage of development, are not ready to go into production for sales to the public. They are being developed now for their expected military value. After the end of the war, further engineering refinement will be necessary before the helicopters go into production for commercial and private purposes.

However, it isn't over optimistic to predict that it will not be more than a very few years until the helicopters have reached that stage of practicality and safety which will enable thousands of us to own and enjoy them for business and pleasure.



1. COMPANY AID MEN

These are the medical soldiers assigned to serve with fighting troops. Reaching the wounded within minutes, often seconds, they give expert emergency treatment, ease pain with morphine, administer sulfa and then tag the casualty for future care.

2. BATTALION AID STATIONS

Litter-bearers rush wounded to these "hospitals" which move to new positions each time fighters advance. Here, medical officers perform emergency surgery, give blood plasma to safeguard men until they can reach fully equipped installations farther back.

3. COLLECTING STATIONS

Close to the zone of battle, these stations care for both walking and transported wounded. They maintain contact with all division battalion aid stations. Here, wounded men are prepared for transportation to more permanent Medical Department units.

WORLD WAR I

8%

WORLD WAR II

3%

WORLD WAR I

WORLD WAR II

AVERAGE DEATH RATE FOR 100 WOUNDED MEN

Today the soldier gives his own wounds immediate treatment. Superior medical care takes over then. Most seriously wounded men are attended to first.

COMPARABLE DEATHS FROM DISEASE IN WARS

In World War I more men died of disease than were killed in action. Today the death rate from disease is 1/20 as high. Malaria is worst enemy.



The illustration shows a winding path of medical facilities from the front lines to the rear. At the top left, a clearing station is shown with a plane. An arrow labeled '30-100 MI.' points to a series of evacuation hospitals. Another arrow labeled 'WITHIN COMBAT ZONE' points to station hospitals. A third arrow labeled 'WITHIN COMBAT ZONE' points to surgical hospitals. A fourth arrow labeled 'THEATRE OF OPERATIONS' points to general hospitals. Finally, an arrow labeled 'WITHIN COMBAT ZONE' points to convalescent hospitals. The path ends at a large general hospital in the bottom right corner, which is situated in a city.

4. CLEARING STATIONS

These are well-equipped but temporary installations serving one division and beyond the immediate fighting area. They have complete surgical equipment, electricity, full kitchen facilities. Triage, the sifting and classifying of patients, is the main function.

5. EVACUATION HOSPITALS

Set up as near the front as practicable, they provide facilities for major medical and surgical treatment of all casualties. From here, evacuees are moved to hospitals in the rear. The recovered wounded return to the front.

8. CONVALESCENT HOSPITALS

Used where no further treatment is necessary. Accept patients from evacuation hospitals who will be fit for full field duty within a reasonably short period of time. The Red Cross and other civilian groups function here.

6. STATION HOSPITALS

Fixed installations providing general medical and surgical treatment in an area of military population insufficient to warrant a general hospital. They are established in camps in the U.S.A. as well as in the zones of combat.

7. SURGICAL HOSPITALS

Fixed units with independent mobile divisions designed primarily to furnish facilities for major surgical work near the front for a limited number of cases. These mobile units help to relieve division clearing stations of non-transportable casualties.

9. GENERAL HOSPITALS

Situated in continental U.S.A., these are large, fully equipped installations staffed with experts in every field of medicine, surgery, and psychotherapy. Among better known general hospitals are Halloran on Staten Island, Walter Reed in Washington, D.C.

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CHAIN LIFE SAVING

NO MATTER where the Yank fighting man goes in this global war, the Army Medical Department is at his side. With its marvelous system of chain life saving from the stretcher bearers on the battlefield to the security of the general hospitals far from the

front, the A.M.D. has piled up a record of soldier saving that is without a doubt the greatest achievement of our war effort. Dubbed the "pill roller," the medical soldier carries no gun, kills no foe. His is the unspectacular job of unending, dangerous work.

August, 1944

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Three Great Sports Cars, Dozens of Other Prizes!

MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

25^c
AUGUST



Fabulous \$50,000 Gold-Plated Car—Page 49

HOW SCIENTISTS WOULD REDESIGN THE HUMAN BODY
LAUNCHING GUIDED MISSILES FROM UNDER THE SEA



About Motor Scooters—Page 64



Water Skipper Does 35 MPH—Page 105

Mechanix Illustrated

A FAWCETT PUBLICATION

COMING NEXT MONTH

- 90-mph Sports Car For \$500
 - Your Dream House For Half-Price
 - A Millionaire Tells How To Get Rich
- And many other exciting features and how-to articles in Sept. MI, on sale Aug. 21.

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AUGUST 1956

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Volume 52, Number 8

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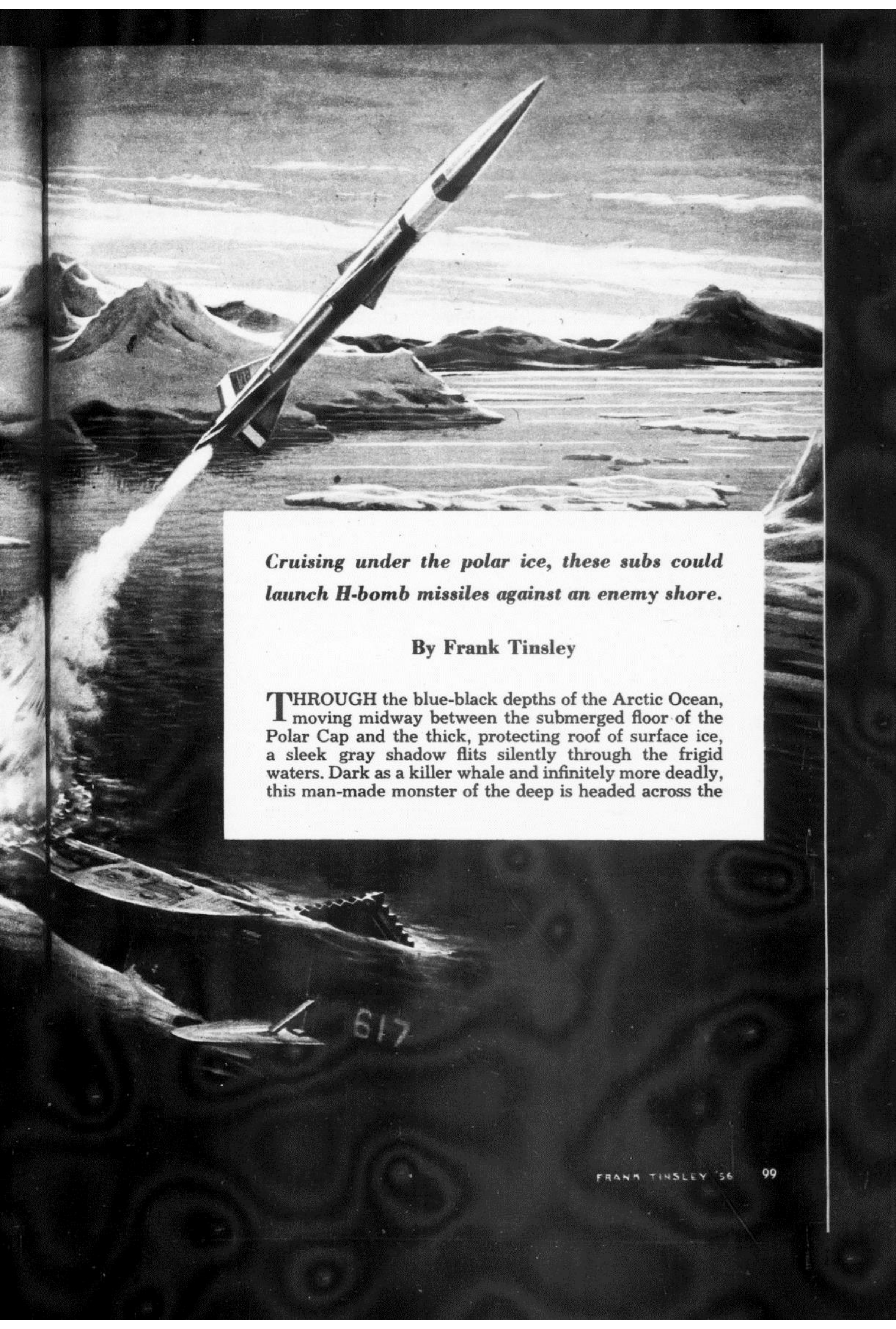
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Mechanix Illustrated

**Why Don't We
Launch Missiles
From Under the Sea?**





Cruising under the polar ice, these subs could launch H-bomb missiles against an enemy shore.

By Frank Tinsley

THROUGH the blue-black depths of the Arctic Ocean, moving midway between the submerged floor of the Polar Cap and the thick, protecting roof of surface ice, a sleek gray shadow flits silently through the frigid waters. Dark as a killer whale and infinitely more deadly, this man-made monster of the deep is headed across the

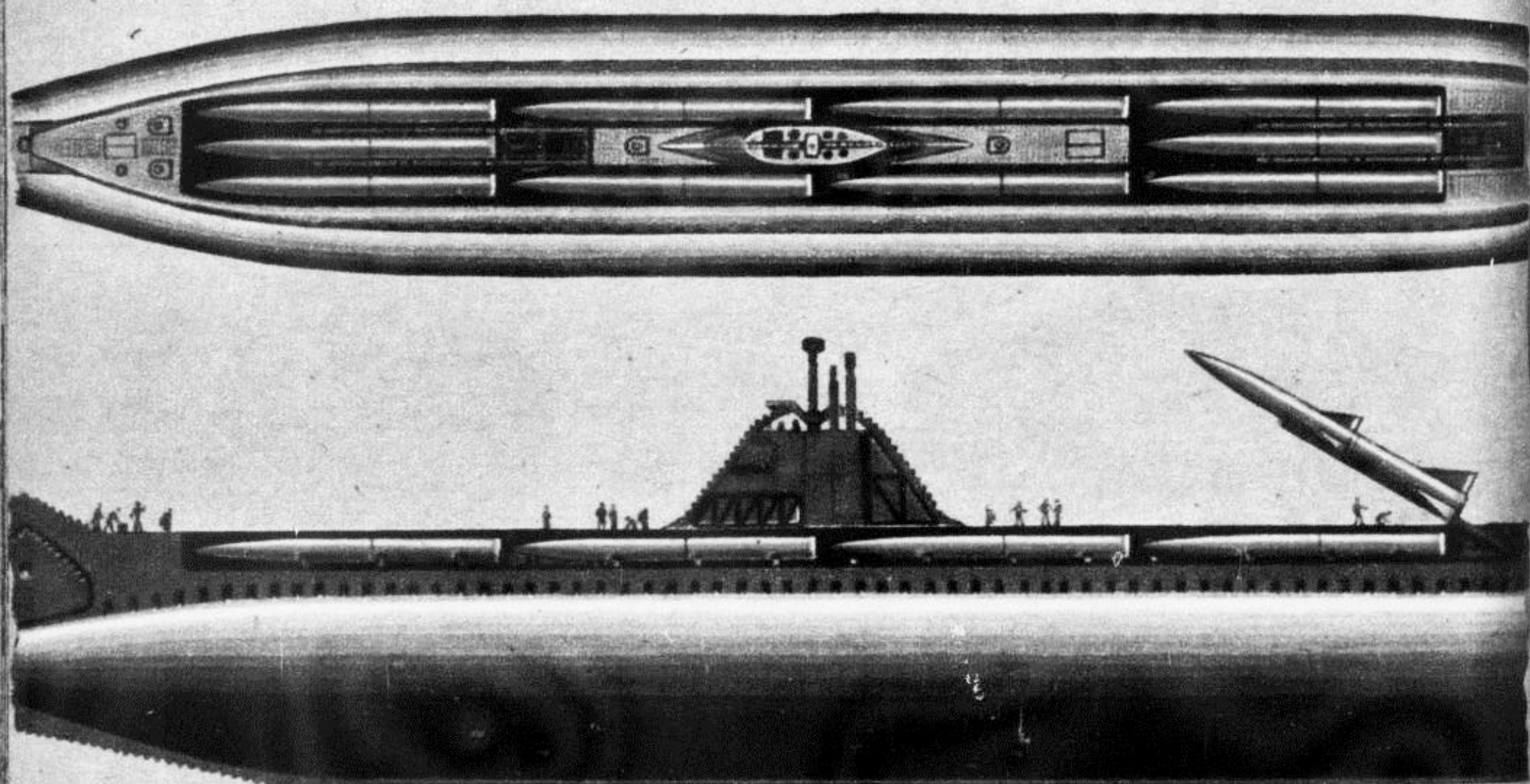
top of the world to deliver a reminder of UN strength that may stave off a full-scale atomic war.

Northward the undersea missile carrier threads its way, sonic feelers charting a safe course between the upthrust bottom pinnacles and the deep hanging icy roots of the floes above. The North Pole is passed well to port and the compasses swing to a southeasterly bearing as the submarine describes a curving course behind the Norse Peninsula. Here, in the slightly warmer waters of the Barents Sea, the broad, dazzling plains of the Polar pack have thinned and crackled into a jumble of close-packed bergs and fields, separated by narrow, winding leads of dark water. As the sub continues southward, these gradually widen into broader lakes and bays where it is safe to surface. Still submerged, the Skipper eyes the navigator's fix and studies his position on the chart. Broad on the starboard beam lies Murmansk of bitter World War II memory. Directly ahead is the wide, gaping mouth of the White Sea, with Archangel on its further shore and beyond that, Moscow, less than 1,000 miles

away. The White Sea entrance may be mined; this is as close as it is safe to go.

With air compressors throbbing, the submarine blows its tank and rises to the surface. Hatches open, lookouts man their posts and the radar slides smoothly upward and begins its endless circling. Below, the missile launching crews tumble out on deck. At their chiefs' command, the long, rectangular covers that conceal the launchers are unlocked and folded back on deck and the men take stations on their cleated inner surfaces. Up on the tiny open bridge, the sub's Skipper receives an almost immediate report from his radar operator. "Unidentified aircraft to starboard." The bearing, estimated distance, altitude and flight direction follow swiftly. "Probably a patrol plane out of Murmansk," the Captain comments. "Keep an eye on it." He decides to go on with the operation.

At his quiet command, the twin launching cradles, fore and aft, pivot upward to a point just above the deckline and hiss to a halt. Snug in their tracks, the sleek, sharp-pointed missiles gleam wetly. Brightly striped fins are



FRANK TINSLEY '56

lifted from racks in the base of the conning tower, rolled along the streaming decks and fitted in place on the missiles. Meanwhile, specially trained officers have armed the atomic war heads and connected the firing cables. Back on the bridge, more radar reports are coming in. "Previously reported aircraft now headed in our direction. . . Group of smaller aircraft headed this way from the mainland." Their compass bearings follow and the Captain nods. "The Murmansk patrol has picked us up and called out a fighter group from the Archangel area." Quickly, he estimates the latter's speed and distance, balancing it against his own firing procedure time. Enough margin to squeeze through, he decides. "Carry on!"

At the order, the launchers tilt a little higher and the tail fins are attached. The birds are now ready to go. Up the cradles go again until the carefully calculated firing angle is reached. The submarine's Quartermaster holds his bow tight on the target bearing and fine directional adjustments are made on the launchers' aiming quadrants. Like well-trained gophers, the launching

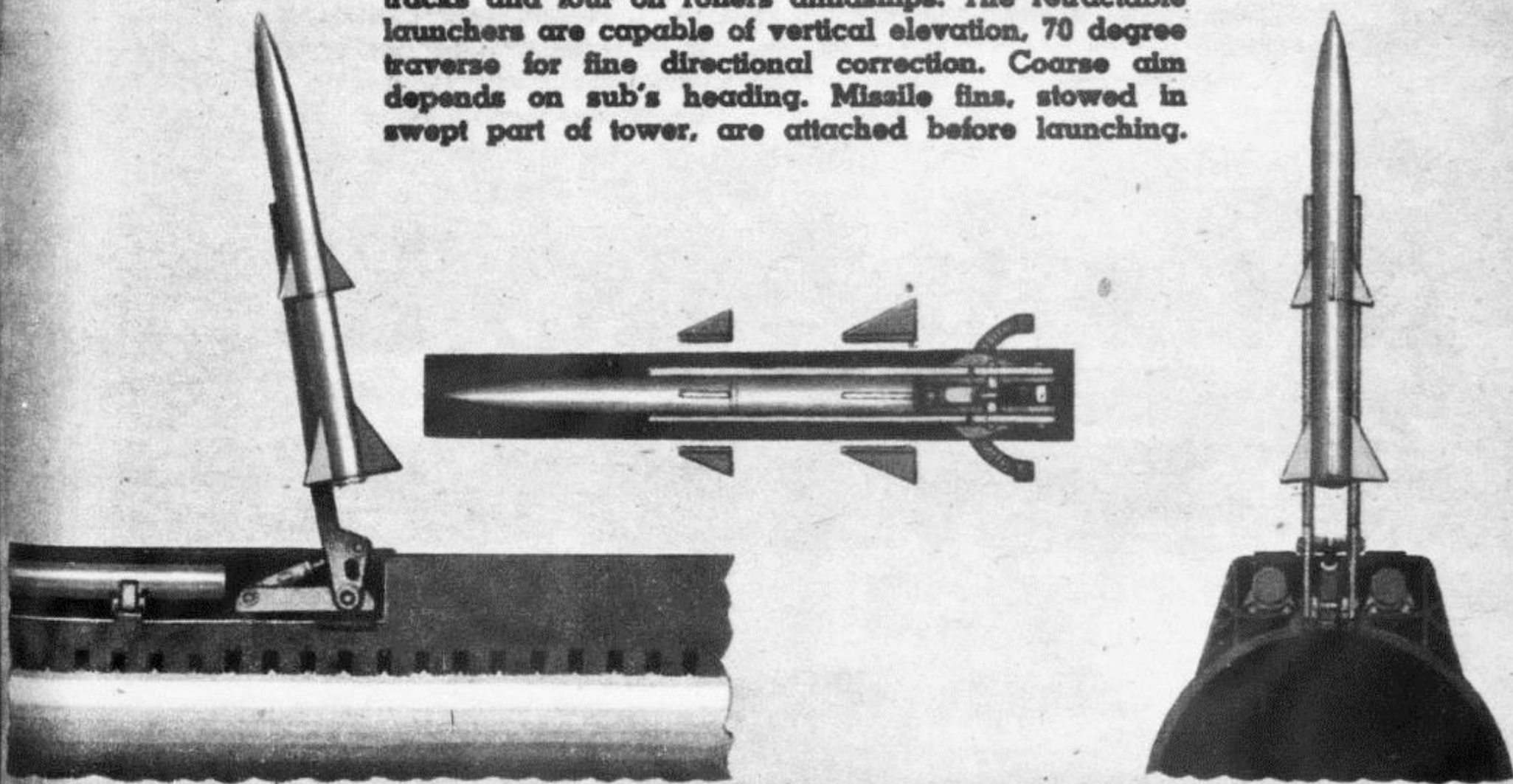
crews pop below decks and hatches are secured. From their inside firing positions, the chiefs report. "Number one launcher ready to fire. . . Number two launcher ready to fire." There is a moment's pause as the Skipper's eye sweeps the craft, the sky and the surrounding sea. "Clear the bridge," he orders.

The command group scrambles down the manhole and the hatch clangs shut. In the enclosed bridge, just below, they resume their posts at duplicate controls and the Captain turns to his Exec.

"Take her down five feet, Mr. Berry."

There is a sigh of escaping air and the submarine settles slowly on an even keel. A smother of foamy water rushes across the decks and swirls around the superstructure. From his porthole the Skipper surveys the set-up. The body of the sub has disappeared beneath the choppy surface and only the tip of the bow housing and stern fin are visible from the still exposed conning tower. Fore and aft, the launchers stand ankle-deep in the sea, their armed and ready missiles held just clear of the water. Below decks, the crew chiefs are gently

MI missile sub carries stripped missiles in deck superstructure above pressure hull; two are stowed in the launchers fore and aft, four on transverse loading tracks and four on rollers amidships. The retractable launchers are capable of vertical elevation, 70 degree traverse for fine directional correction. Coarse aim depends on sub's heading. Missile fins, stowed in swept part of tower, are attached before launching.



working the aiming quadrants, keeping the crossed hairs in line. Over the loudspeaker comes the Captain's quiet voice. "In salvo of two—fire when ready!"

There is a moment of tension in the conning tower. Will the firing abort completely, leaving the surfaced sub exposed to the oncoming interceptors? Will one of his lethal fledglings rise, circle and boomerang back on its nest—or falter in take-off and topple over in an atomic cataclysm?

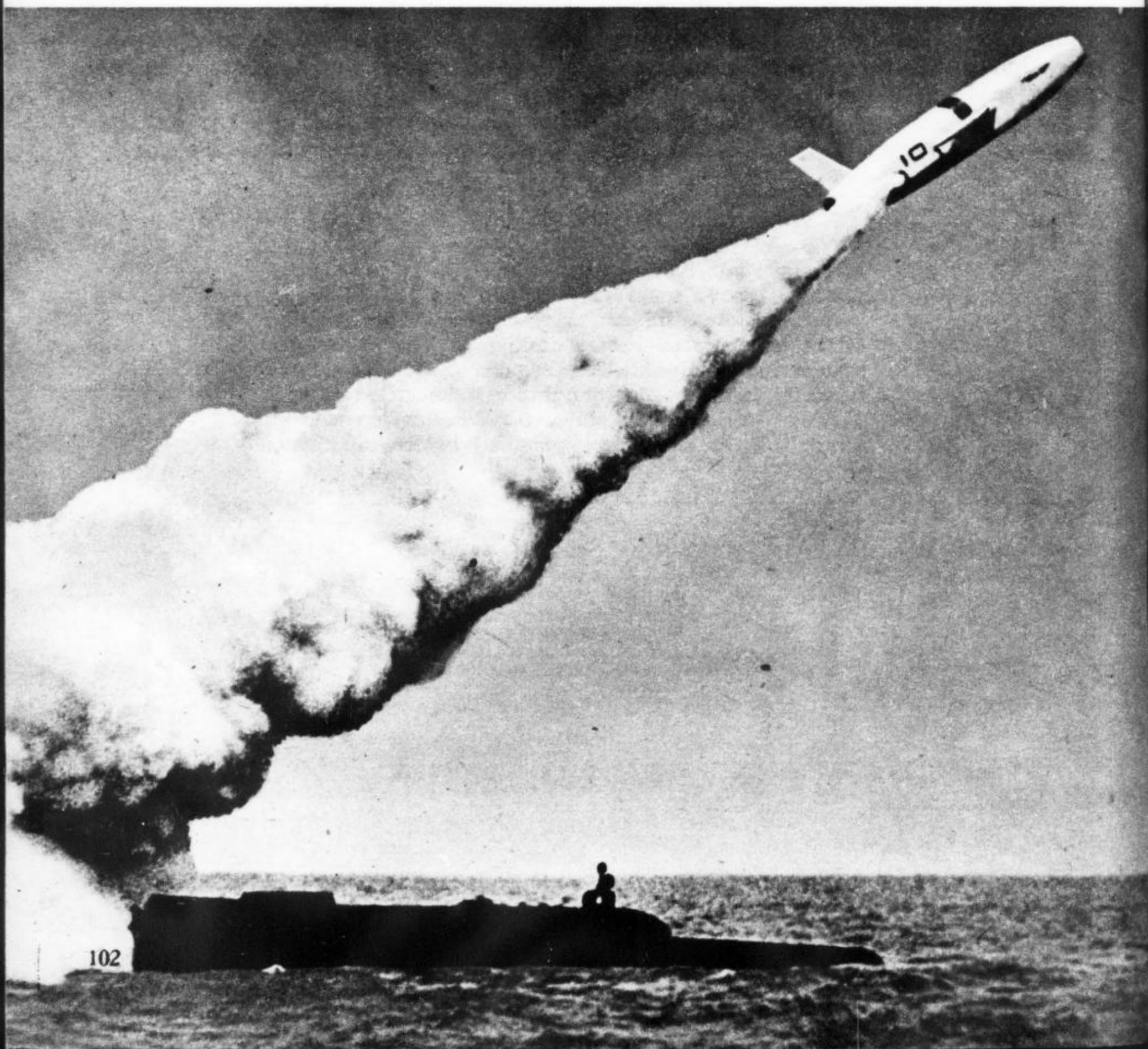
Then from the forward deck comes a blast of incandescence that flattens the water into boiling eddies. With painful slowness, the bow missile lifts, gathers speed and suddenly whooshes upward out of sight. A split-second later, a twin roar echoes from astern and

the after bird follows its mate aloft. There is a pause of stunned silence in the conning tower and the tension breaks in a wave of exultant relief. They're off safely! The job is done! The command group eye each other smilingly. Their unspoken congratulations are interrupted by the matter-of-fact voice of the radar operator. "Bogies now within 150 miles distant!"

Less than two minutes away! The Captain comes out of his trance like a man on springs. The heel of his hand slams down on the red emergency button and the whoop of sirens fills the ship. **CRASH DIVE!**

The foregoing description is no mere pipedream. Missile launching from surfaced submarines has been perfected to

Firing of the Navy-Chance Vought Regulus from USS Tunny opened era of missile subs.



the point of combat readiness and the U. S. Navy has already begun work on three special missile subs. Currently experiments are progressing on underwater rockets that can be launched without showing so much as a periscope tip!

The Soviet Navy is known to be carrying out similar tests and with their long headstart in military rockets may even be ahead of us in actual techniques.

MI's submarine raider, designed for this specific purpose, combines the characteristics of the atomic Nautilus and the Killer class boats, with some unique features of its own. A long, raking prow replaces the boxy bow of the K-boats, yet provides ample room for the Killers' electronic detection gear. Rising to a point six feet above the deckline, and then sweeping down again in unbroken lines armed with cable-cutting teeth, there is not an inch where anti-sub nets can catch or lodge. The tail fins have been treated in a similar manner with rudders and propellers enclosed in rigid, net-cutting outer frames.

The conning tower, similar in size and arrangement to that on the Nautilus, is also swept back in profile, the extra space being utilized for the stowage of demounted missile-fins. A sawtooth structure extends from the forward and after edges, up over the top of the tower, protecting retracted periscopes, snorkel, etc., like the inverted trigger guard of a gun. The radar head is incorporated into its tubular central support and is shielded by a hinged top gate when not in use.

Missiles are carried in the submarine's superstructure, packed in a sort of horizontal, rifle-magazine arrangement. The launchers, each loaded with a "firing round," are mounted on the ship's centerline beneath the forward and after decks. Each is flanked by two "ready rounds" resting in cradles that roll on transverse tracks. They are fed sidewise on to the launchers as required. Four "reverse rounds" are stowed amidships on either side of the conning tower. These move endways on fixed rollers and can be shifted forward or aft and on to the "ready" cradles. This set-up allows the missile load to be distributed after each shot and the vessel

kept in balance trim. The design calls for ten missiles, each 60 feet long and five feet in diameter.

MI's arctic submarine is just under 400 feet in length. It is atomic powered, manufactures its own heat, current, drinking water and conditioned air, and is capable of cruising submerged for indefinite periods.

To escape enemy detection in arctic waters, a new device permits the MI craft to silence its propulsive machinery and moor itself to the underside of the polar ice pack. When a more or less level area is found the sub heads into the current at zero speed and her tanks are blown until the top of the tower is just below the ice. Two stout samson posts, hinged to the bow and stern superstructure and operated by hydraulic cylinders, are then raised to a vertical position. Within them are strong, retractable tubes carrying superheated steam from the atomic pile. These "hot rods" are pushed against the lower face of the floe and burn their way up into the ice.

When they are buried deep enough to give a secure hold, the steam is cut off and the ice freezes back around them. The submarine is then immovably moored and can lie quietly as long as it pleases. Turning the steam back on again frees her in a few moments. In the large illustration, the bow samson post can be seen folded down for cruising. It is serrated for net cutting and forms the leading edge of the ship's prow.

This, then, is our concept of a missile submarine. It can operate anywhere in the seven seas, functioning equally well in tropic waters and in the chill, ice-encrusted oceans of the poles. With properly trained "frogman" crews, it can arm and launch its rockets from below the surface and in a pinch, even burn a gun-like bore up through solid ice to hurl destruction from beneath the polar packs. A fleet of such policemen is the cheapest insurance the free nations can buy. In the present state of the world it could easily avert a major nuclear war by its very existence. Why don't we have Underseas Missile Launchers? •

SEPT.
25¢

MODERN MECHANICS

AND INVENTIONS

A ONE MAN BICYCLE
BALLOON-SEE PAGE 80

Moving Oceans Inland

HOW MID WESTERN CITIES MAY BECOME SEAPORTS

MODERN MECHANICS AND INVENTIONS

VOL. II NO. 5

PRICE 25 CENTS

a *FAWCETT Magazine*

This Magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

SEPTEMBER, 1929

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Edited by Experts

Listed below are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers concerning their departments. Address them in care of this magazine, Robbinsdale, Minn.

- MAJOR H. H. ARNOLD
Former Assistant Chief,
U. S. Air Service
- PILOT GENE SHANK
Famous Aviator, Holder of
Light Plane Endurance
Flight Record
- WESTON FARMER
Naval Architect and Light
Plane Designer
- IVAN DRIGGS
Noted Light Airplane
Designer
- A. NEELY HALL
Author of "The Boy Crafts-
man," etc.
- CHARLES MAGEE ADAMS
Nationally Known Radio
Expert
- WALTER D. KERST
Associate Member, Society
of Motion Picture Engineers
- RAY F. KUNS
Principal, Cincinnati Auto-
motive Trade School
- PERCIVAL MARSHALL
Foremost Exponent of Model
Making in Great Britain
- PHILIP L. RHODES
Naval Architect
- CHARLES HALL
Former Editor of "Motor
Boat"

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Edited by MAJOR H. H. ARNOLD

Aircraft Are Vital Units in Battle Plans for the Next War

DURING the past few years there have been many improvements in the implements of war. Tanks can now attain a speed of over twenty miles an hour and types have been produced which can travel over land or float on water. Armored cars have been provided for cavalry, thus giving the advanced patrols of that mounted force a very fast and powerful weapon. Anti-aircraft guns are now aimed and fired in groups by electricity. Gas and smoke can be thrown out in clouds and curtains by aircraft. The radio controlled autos operating in different parts of the world were only forerunners of radio controlled airplanes such as have recently been demonstrated in France. Nations that numbered their airplanes in hundreds in 1918 now plan on having thousands available for any future emergency.

It is highly probable that any future conflict will see planes by the hundreds striking on the opening day. These planes will be able to do many things that could not be done in the past. The pursuit planes will travel through the air at a speed

of about 200 miles an hour. The bombers will carry loads of 2000 pounds and will have machine gunners for protection in front and rear, making it quite a task for the pursuit planes to find a blind spot for their attack.

Cities and other important places will be protected by zone after zone of electrically

controlled anti-aircraft guns that are directed on the aircraft without the aid of human hands. At some distant point there will be several men taking down and recording data on the approaching fleet of airplanes. As the data is entered on the machines, the guns will automatically move in elevation and traverse themselves to make hits instead of misses.

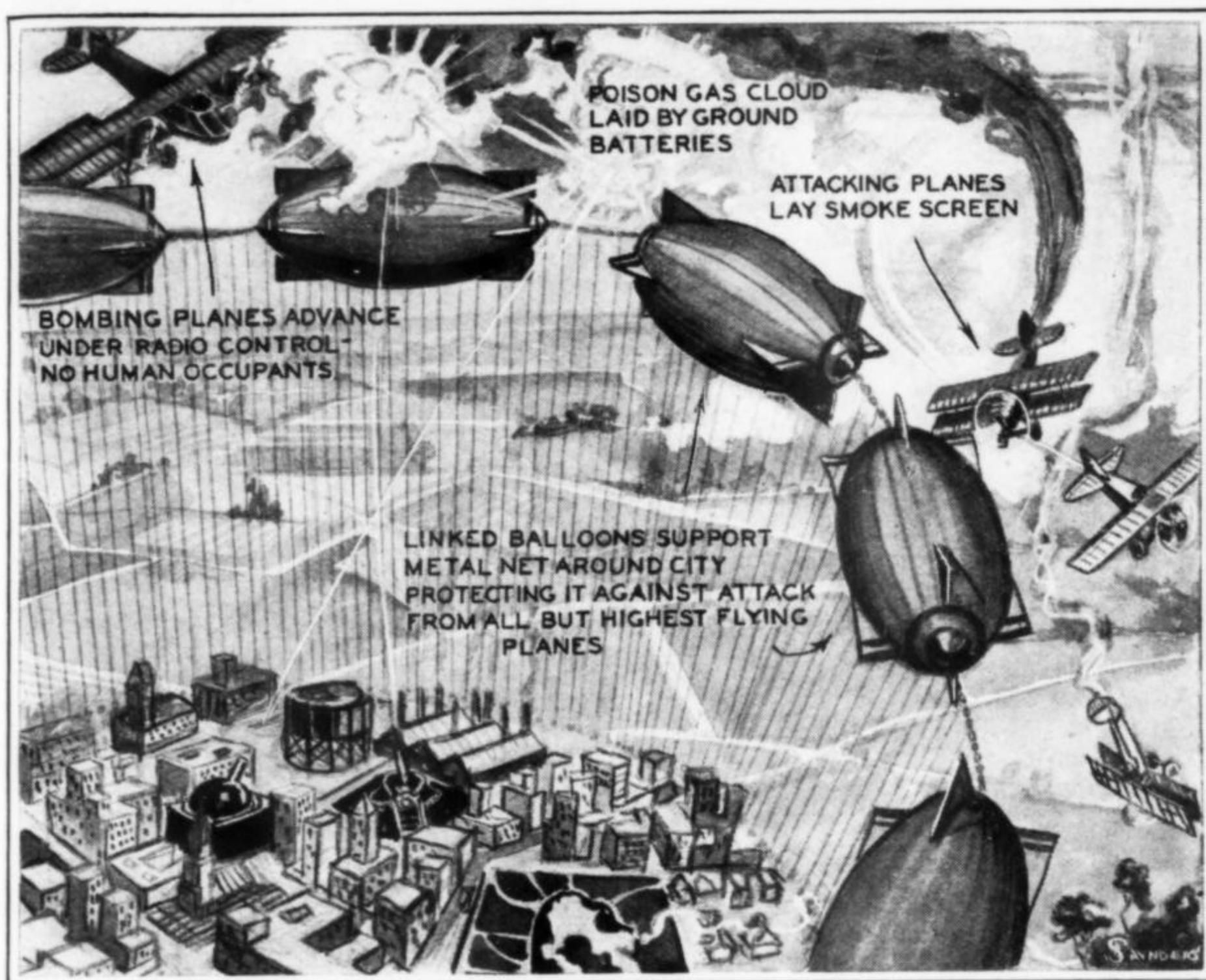
Zones of searchlights will be placed beyond the guns so that the approaching aircraft will be illuminated before they reach the danger zone. When the searchlights open up, the attack planes, coming in over the tree tops like streaks of light, will open up with their bursts of tracers and drop their small bombs in an endeavor to extinguish the lights.

Balloons will be placed at



Major H. H. ARNOLD
One of the pioneer figures in the world of aviation, Major Arnold is admirably qualified to serve as editor of this monthly aviation department of *Modern Mechanics*. He was present at the first demonstrations of the Wright plane as an official government observer, and ever since that time he has been actively engaged in some branch of flying. During the war he was assistant chief of the Air Service.

Balloons Supporting Metal Cables Protect City Against an Aerial Attack



An artist's conception of an aerial battle of the next war is presented above, showing the different methods of attack and defense. Metal cables suspended from balloons, gas clouds laid high in the air from ground batteries, and smoke screens laid by planes are all developments of military science.

intervals around all important areas. Each balloon will be connected to the ground with a steel cable and from the adjacent ones with horizontal steel wires. Thus there will be formed an impenetrable, invisible barrier through which the attacking planes can not pass. It may be that the large caliber guns will be able to throw gas shells into the air, forming a gas cloud which will knock out the pilots when they enter the gas zone. It is possible that defense planes will be able to lay a smoke screen high in the air through which the airmen can not pass, or a cloud which will deprive the engines of oxygen and thus bring the planes down.

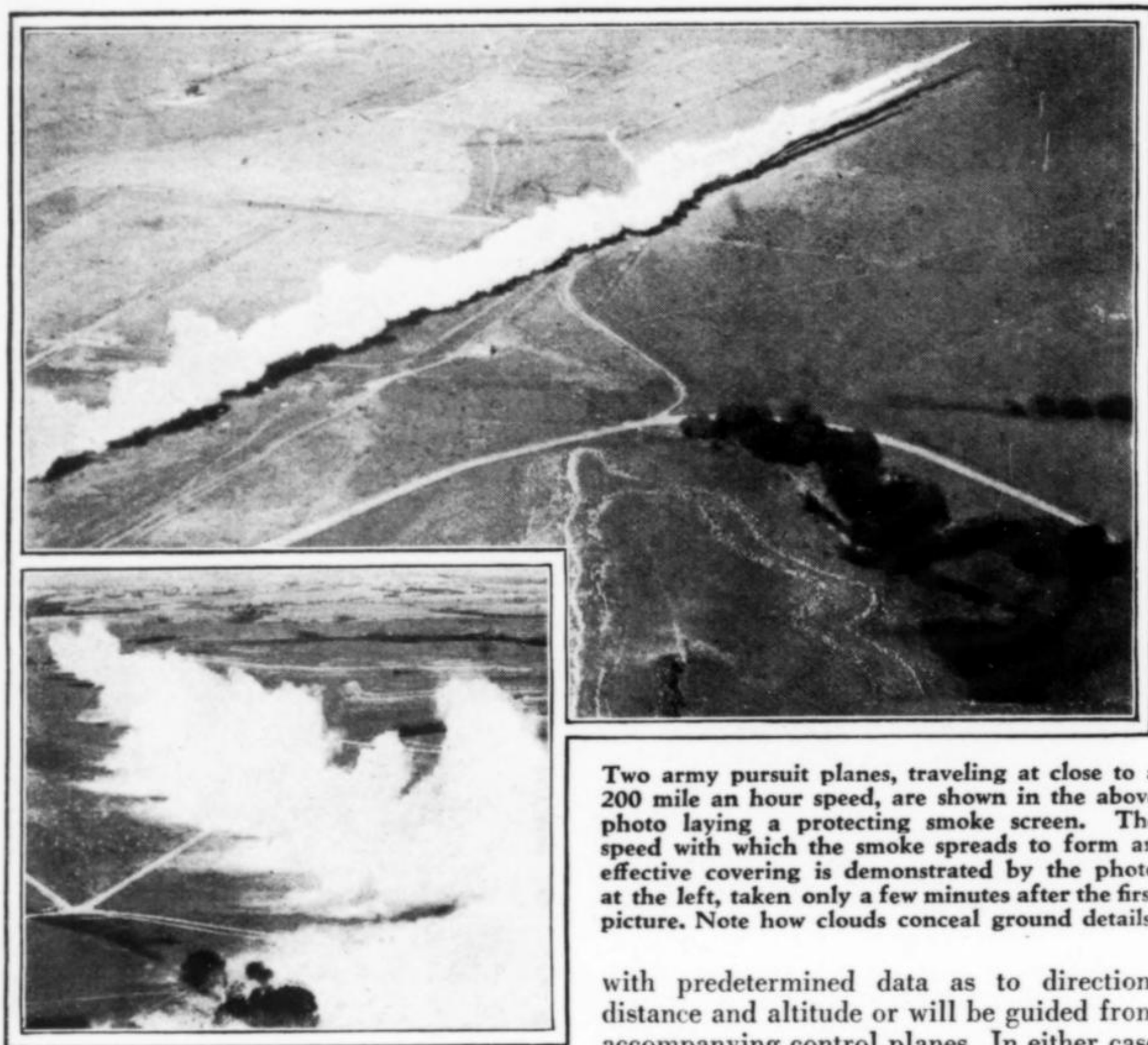
It might appear that the airplanes coming in to attack may get the worst of the exchange of death-producing missiles, but the engines having superchargers will be able to take the bombers high above the

balloon barriers and to altitudes where the anti-aircraft guns are unable to shoot accurately. Then again they can take advantage of low fog, clouds and murky days, weather conditions which permit the man in the air to see when the man on the ground is blinded.

The bombers will carry loads of demolition, incendiary and gas bombs. Superchargers will be installed on the engines to enable the planes to get above the accurate range of anti-aircraft guns. At the extreme altitudes the bomb sights will be just as accurate if not more so than at the lower altitudes.

For protection, the bombers will be accompanied by fast pursuit planes laying smoke screens at a rate of over two hundred miles an hour, attack planes dropping small bombs and spraying machine gun bullets on the anti-aircraft guns. Thus about the time

Attackers Can Advance Under Cover of Smoke Screen Laid by Planes



Two army pursuit planes, traveling at close to a 200 mile an hour speed, are shown in the above photo laying a protecting smoke screen. The speed with which the smoke spreads to form an effective covering is demonstrated by the photo at the left, taken only a few minutes after the first picture. Note how clouds conceal ground details.

of arrival of the bombers, the anti-aircraft defenses will be literally covered with gas, smoke, small demolition bombs and a storm of machine gun bullets.

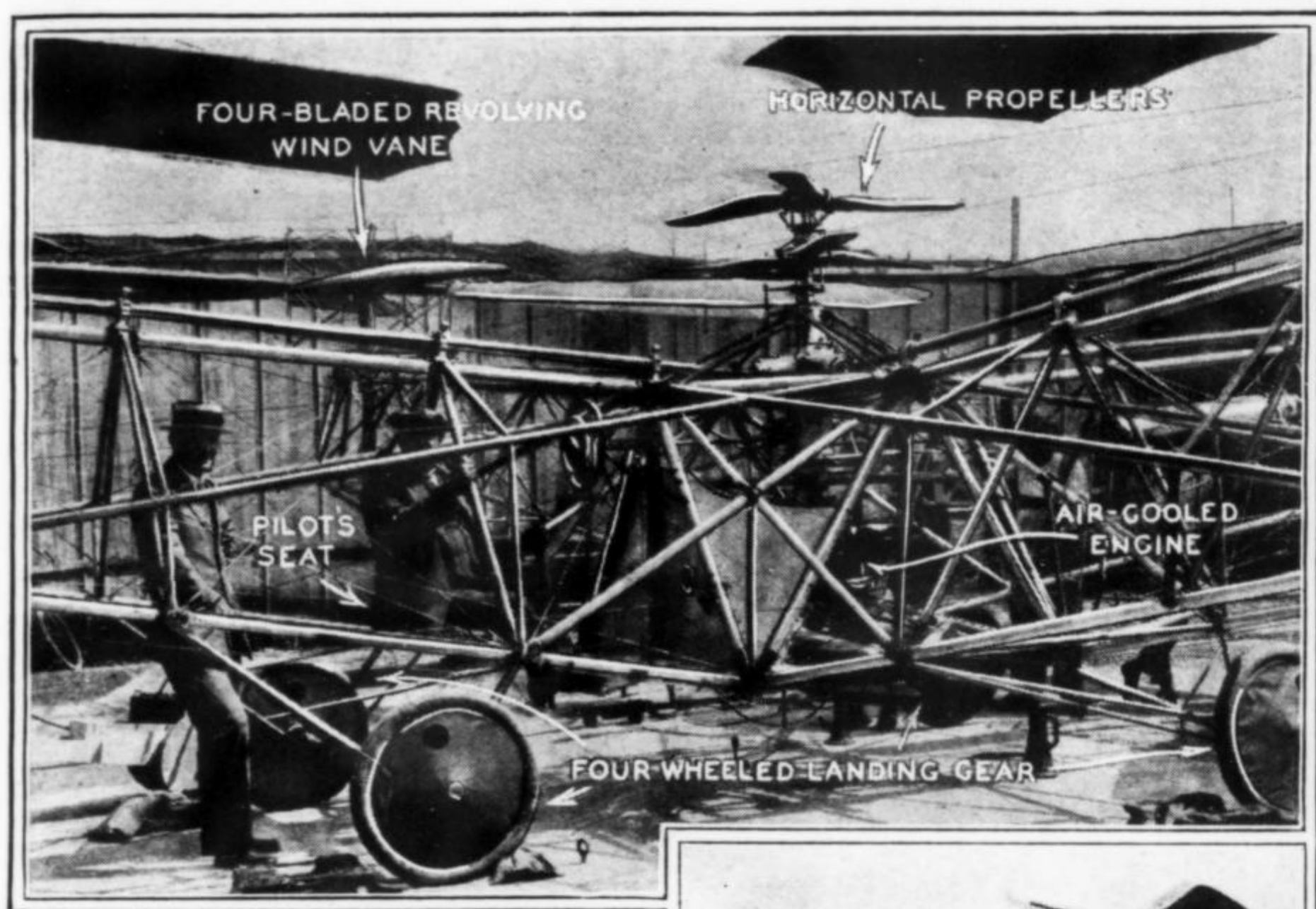
The development of the radio has made possible the driving of the automobile without human hands at the wheel. It is now possible to guide an automobile through all sorts of intricate maneuvers from a control station far distant, either in the air or on the ground. Using the same general principles, the French have produced a plane which takes off, maneuvers and lands with the pilot seat vacant.

Such radio controlled planes will undoubtedly make their appearance and give additional trouble to the defenders against air attack. Such planes will be loaded with large quantities of high explosive and be guided toward their target in accordance

with predetermined data as to direction, distance and altitude or will be guided from accompanying control planes. In either case the balloon barriers, the anti-aircraft guns and the gas filled air will not stop the attack, for such automatic planes will be sent out one after another in an ever increasing stream, stopping only when the objective has been destroyed. If one, two or three hit the balloon net, are shot down or make a forced landing, it will make no difference for there will be hundreds to take their place with no loss of life to the attackers.

There were so many innovations during the World War, the conflict was so extensive and the incidents of the battle field were so horrible that it seemed that the ultimate limit in scientific warfare must surely have been reached. Any student of science, mechanics or inventions can not help but realize the fallacy of any such conclusion, for man has never yet produced a perfect piece of machinery.

Helicopter Designers Achieve Small Success With Type



One of the few helicopters which have succeeded in leaving the ground under their own power is the DeBothezat type pictured above. Note the pilot's seat in the center of the fuselage, with the four-bladed horizontal wind vanes above. Inset shows machine in flight a few feet off the ground.

IN GENERAL there are two lines of thought in construction of helicopters. One school endeavors to secure its lift from the revolution of one or more large surfaced vanes, and the other from large propellers. Both types have been more or less successful; that is, there have been machines of both types constructed which left the ground for a limited period.

A typical helicopter was the Berliner. This machine utilized an ordinary aircooled airplane engine. For its lift, it had a gigantic balsa wood propeller which rotated in a horizontal plane above the structure. To secure balance, two smaller propellers were installed some distance from the central fuselage opposite to the pilot. Thus extra lift was obtained for lateral control by increasing or decreasing the revolutions of one or the other of these small horizontal propellers.

An additional small horizontal propeller

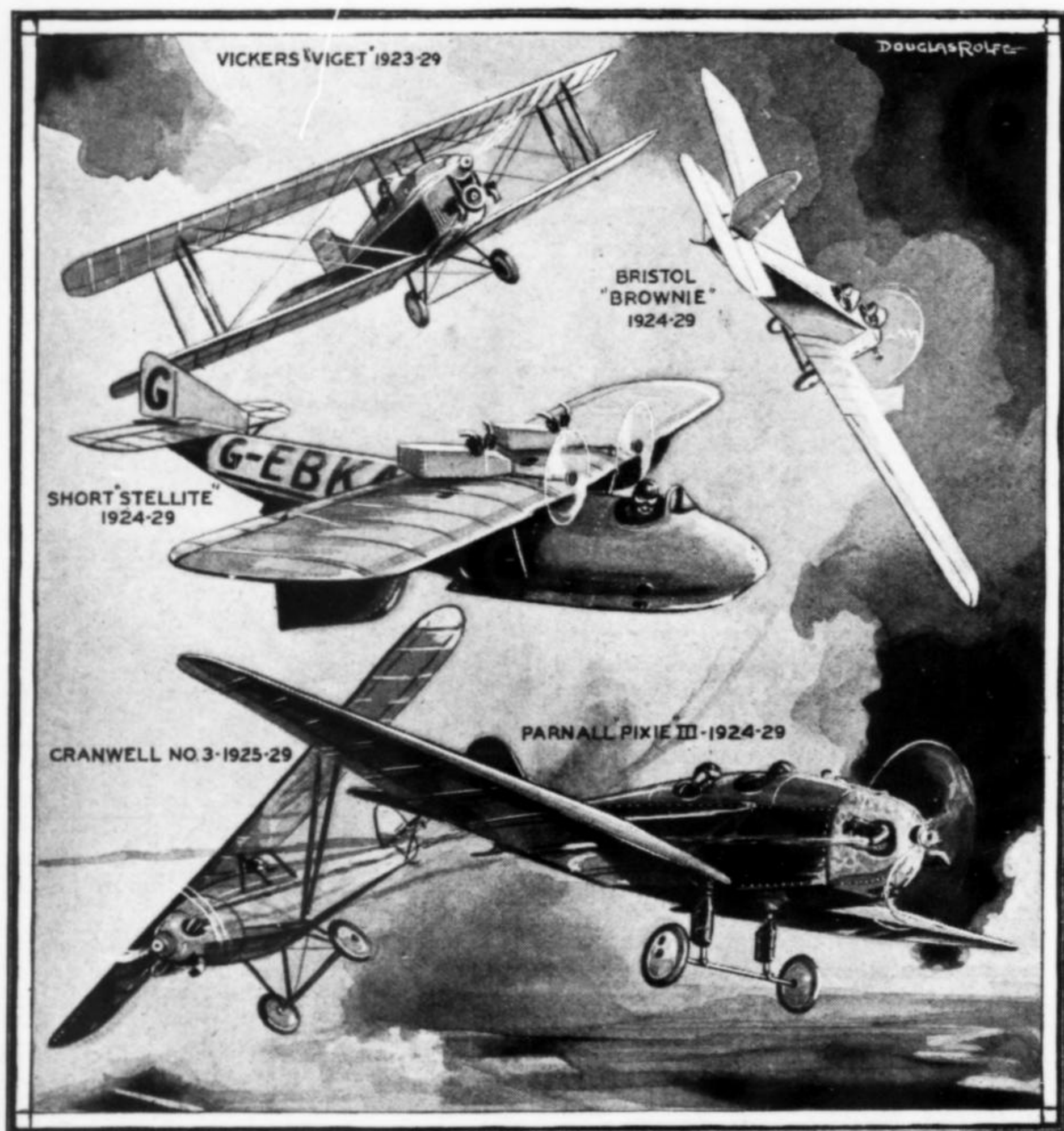
was located at the stern of the device. By increasing the revolutions of this propeller, the tail was raised or lowered.

The De Bothezat helicopter had four revolving wind vanes, each with four blades to secure its lift. These were mounted at the tips of open structures similar to fuselages, crossing at a center point. The engine was mounted in a horizontal position at the juncture of the four structures.

The Berliner model had a landing gear very similar to the two wheel and tail skid airplane type. De Bothezat used four wheels mounted in pairs on axles.

These two helicopters have been by far the most successful produced in the United States. Both have made several successful test flights, but like similar aircraft produced in other countries, were not developed to a point where they could be called practical for use either commercially or for military purposes.

English Light Planes



Because they are beautifully engineered down to the last fraction within the required factors of safety, these British Lightplanes which have been built from 1923 to the present year are enabled to fly with low horsepower.

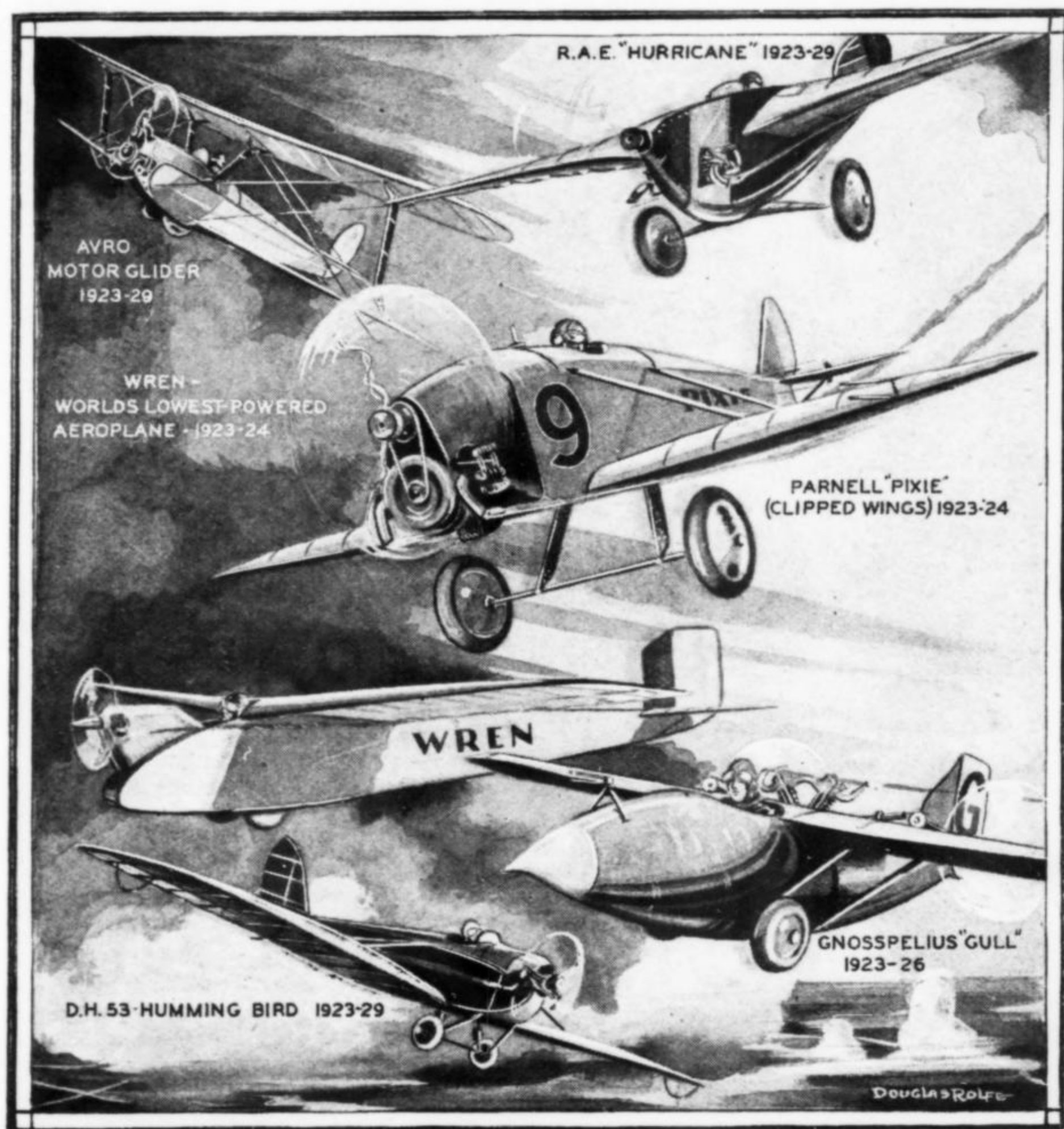
By DOUGLAS ROLFE

FOR the past half dozen years our English cousins across the big pond have not been asleep when it comes to the development of light air planes. In fact they are to be credited with the inception of the movement, and the planes which they have built in this time, the more successful

of which I have pictured above in light wash drawings, have led directly to the design of the high performing and so called lightplanes of today, the De Havilland "Moth", the Avro "Avian", and the Westland "Widgeon".

To the uninitiated let us explain that the

Perform Like Big Ships



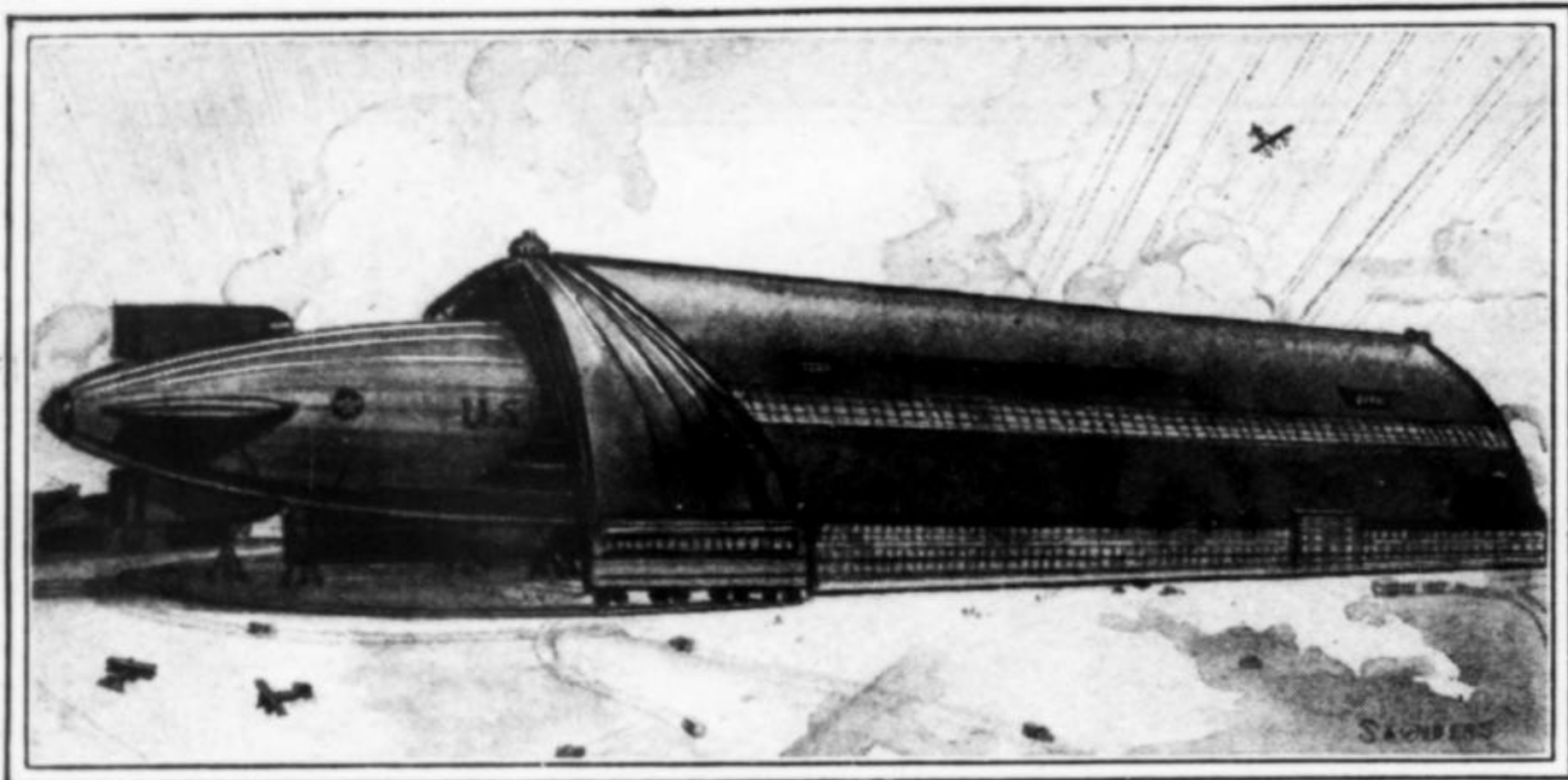
From the tiny Wren, flown with but $2\frac{3}{4}$ h. p. and which can make 90 miles to the gallon of gas, to the stunting D. H. 53 powered with one of the 16 h. p. Bristol Cherubs, these planes have performance equal in every respect to the present 80 h. p. lightplanes.

word lightplane is generally taken to mean a plane which will carry one or possibly two passengers on a power which is low enough to load the wings to the highest possible point, allowing of safe flight. Arbitrarily, these light ships are as good if not better in flight than their more highly powered 80-100 h.p. sisters. Most of their

weights work out to 500 lbs. or less, loaded.

Let us trace the history of the lightplane movement. Thus we will be enabled to understand the progress that has been made and what lies behind the designs of today.

In 1923 a number of English aircraft manufacturers produced various types of
(Continued on page 172)



A unique feature of the mammoth new hangar will be doors swinging on tracks. These are to be segmented like orange peels. Greater wing protection is afforded by this method of construction.

MONSTER BUILDING to be WORLD'S Largest Hangar

FOURTEEN football games could be played at once in the giant dirigible hangar now being built by the Goodyear Zeppelin Corp., at Akron, Ohio. In the structure will be housed the two new 6,500,000 cu. ft. Zeppelins recently ordered for the U. S. Navy. The building is the largest hangar ever attempted and when completed in 1930 will be the largest building without interior supporting pillars ever erected.

This feature—pillarless floors—brought the engineers up against a problem which was unique in the annals of structural engineering. How would the tops of the arches be put in place? The tallest cranes in service would reach no more than half way up the sides of the building.

Here is the clever way in which the problem was solved:

Frames for the lower sides of the arch were erected on pile foundations, and supported by posts. Between them the top section of the arch was put in place, and a wire stretched between the temporarily loose ends to keep the shape of the arch preserved.

Then weights were hung as counterbalances over the ends of the perpendicular

posts, and a small amount of power was all that was required to raise the arch. Just like raising a window sill! The drawing at the right explains graphically how this feat was performed.

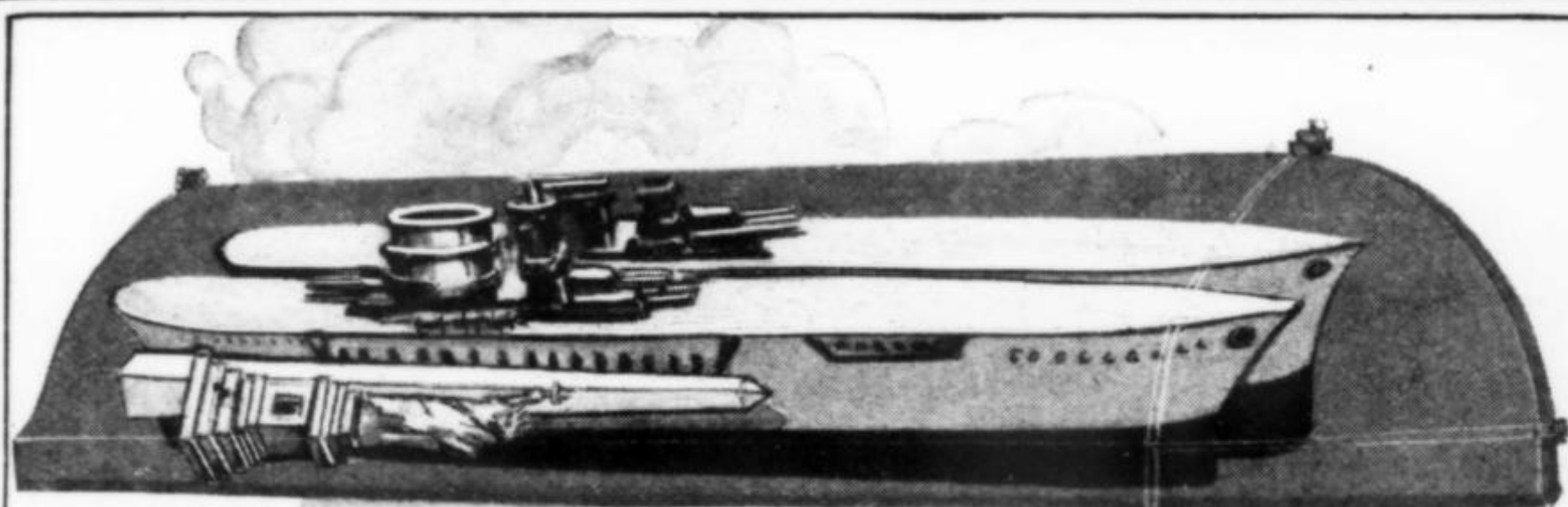
A concrete idea of how huge the building will be may be gleaned from the figures: Length, 1200 feet; width, 325 feet; height, 200 feet; *unobstructed* floor space, 390,000 square feet.

Six thousand tons of steel were required in the order, 7000 cubic yards of concrete, and 1300 piles.

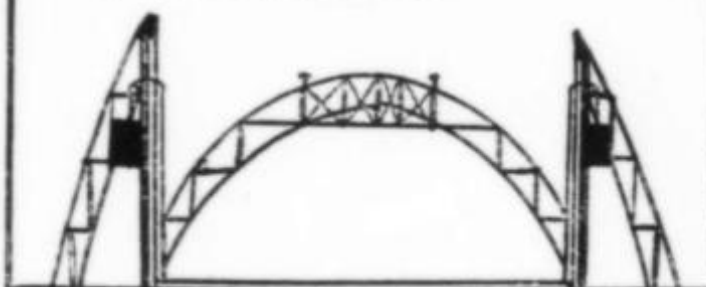
In other words, the hangar is so large that the U. S. S. *Lexington* and the U. S. S. *Saratoga*, Uncle Sam's newest airplane Mother ships, together with the Washington Monument and the Statue of Liberty could be comfortably housed within the hangar.

Engineers from all over the world watched the raising of the steel span into place. The span was hung in place over night, being held by 288 tons of counterweight, and at the dawn of a working day 75 men were on the job and within an hour had the span raised. Twelve more arches such as pictured will be required. They will be erected at the rate of three a week.

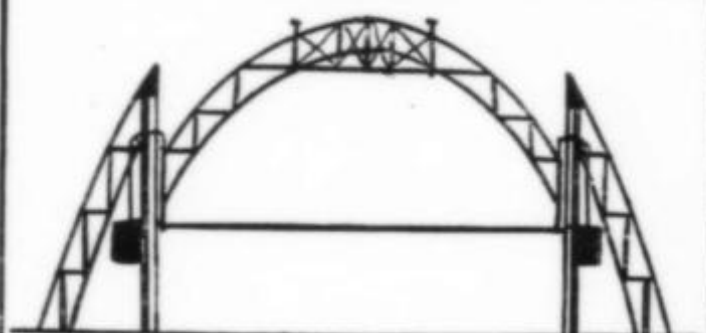
Enormous Hangar Could House Two Battleships With Room to Spare



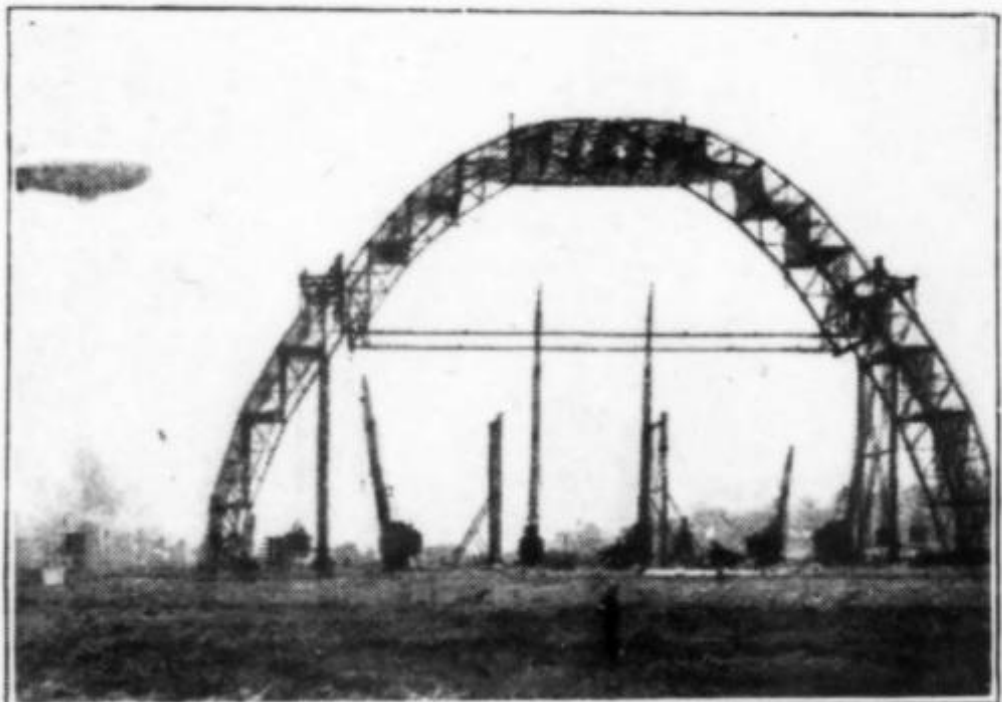
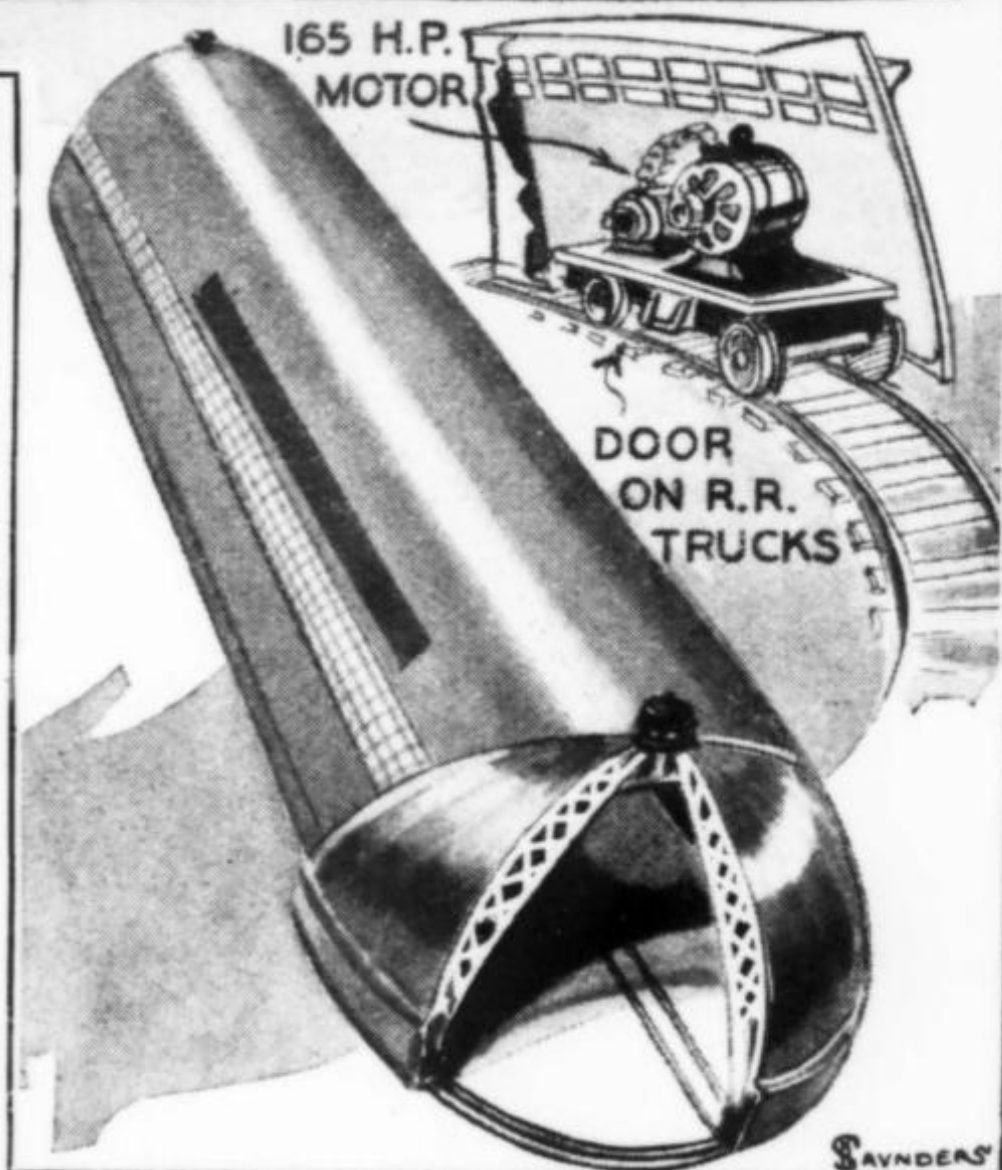
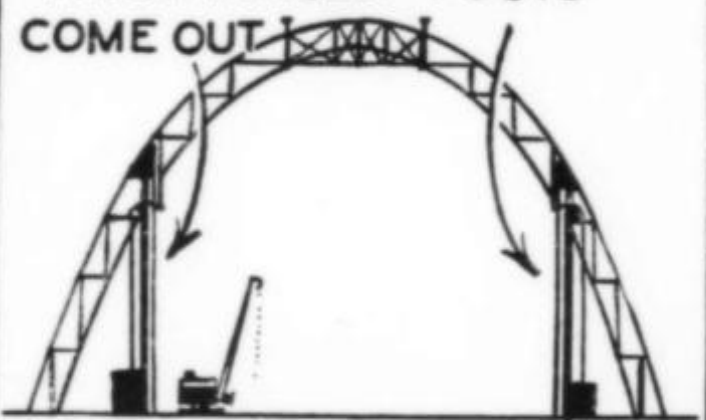
ARCH IN PLACE WITH
COUNTERWEIGHTS READY
TO RAISE IT



HALF RAISED; WIRE ON
BOTTOM KEEPS ARCH SHAPE



ARCH RAISED - POSTS
COME OUT



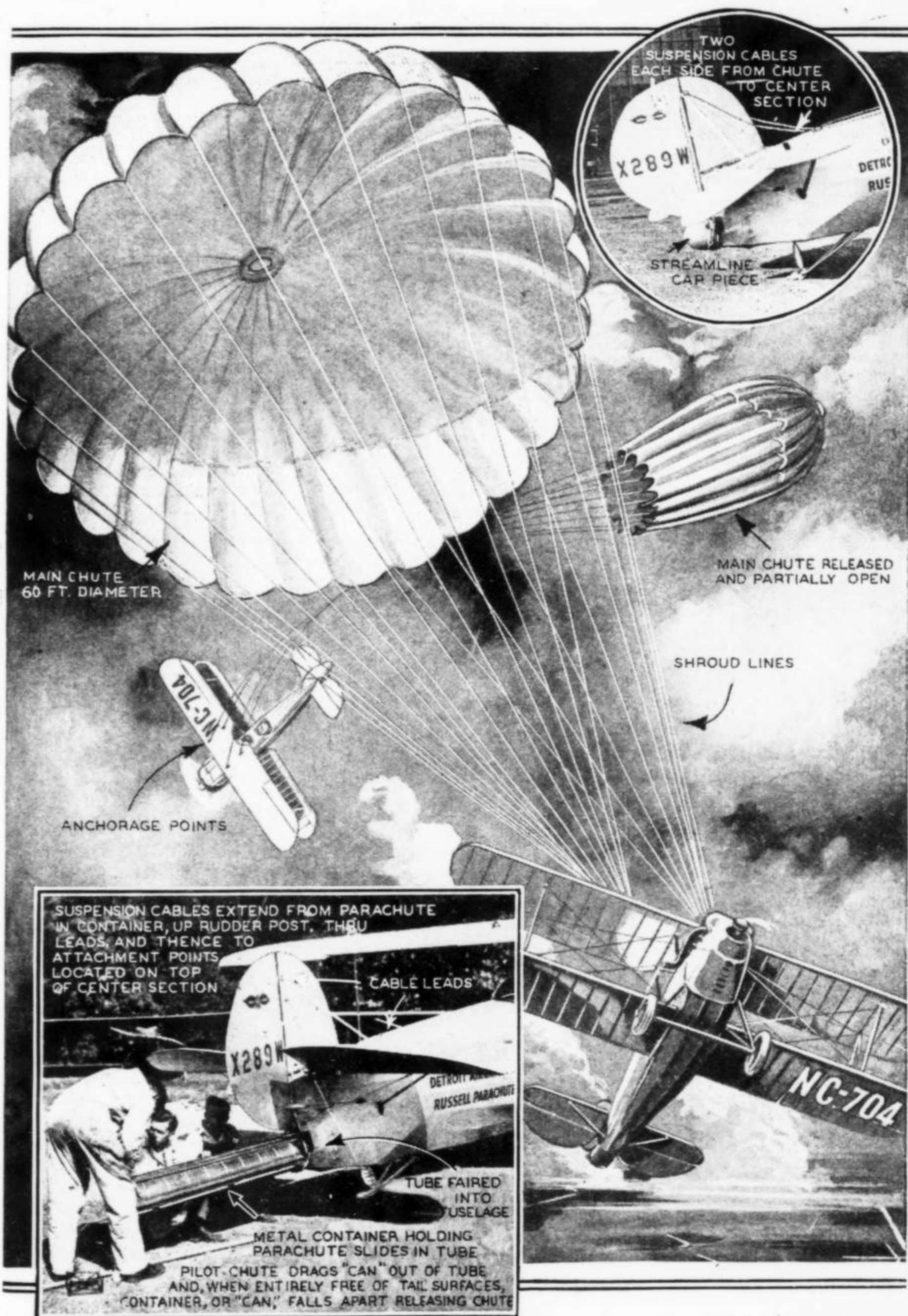
The Lexington and the Saratoga, together with the Washington Monument and the Statue of Liberty could be housed with room to spare in the new hangar. Segments of the doors run on tracks and are opened by electricity. The method of raising the arch with counterweights is graphically depicted. The photo in the lower right hand corner shows the arch in place immediately after hoisting.

Parachute Seats Land Passengers of Airplane in Safety



One of the latest safety devices developed for airplane use is the seat parachute illustrated above which releases passengers through the bottom of the plane in case of danger. Builders are now experimenting with the device with the idea of developing it as standard transport plane equipment.

New Way to Lower Plane by 'Chute



A new type of airplane parachute, shown in the drawings above, recently proved successful in tests.

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MODERN MECHANICS

AND INVENTIONS

12 CU

STRANGEST PLANE
EVER BUILT
SEE PAGE 67

STEWART
ROUSE

WII I GIANT INSECTS RII F WORLD?

Other Fawcett magazines are Screen Play Secrets, Triple-X, Battle Stories, True Confessions, Mystic Magazine and Hollywood.

MODERN MECHANICS AND INVENTIONS

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HIGH SPOTS IN THIS ISSUE

Another big new contest is announced in this issue. You'll find all the details on page 77. With the long winter nights coming on, the radio fans will again come into their own. On page 114 you will find complete plans and instructions for building a real long-distance low-power transmitter. And then turn to page 80 and find out how a man made a million dollars with crazy inventions.

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Donald G. Cooley
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Major H. H. Arnold
Former Assistant Chief,
U. S. Air Service

Pilot Gene Shank
Famous Aviator, Holder of
Light Plane Endurance
Flight Record

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Naval Architect and Light
Plane Designer

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A. Neely Hall
Author of "The Boy Crafts-
man," etc.

L. B. Robbins
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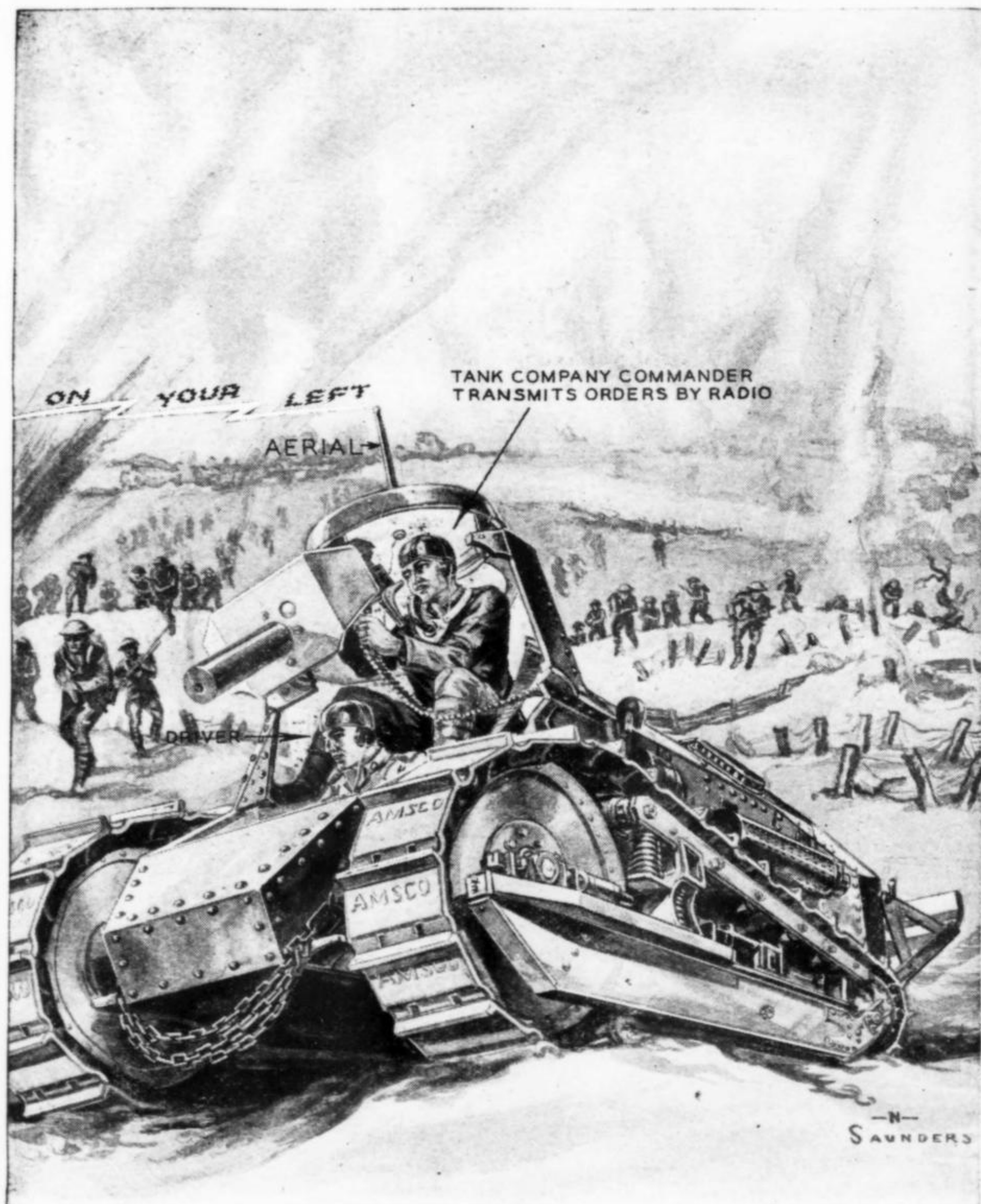
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TANK MANEUVERS



One of the latest developments in the mechanization of the army is the installation of radios in tanks for the transmission and receipt of orders. Control of tanks in action, since they were first introduced by the British during the World war, has been at once an important and difficult task, hitherto performed by officers who walked beside the tank and signalled with flags—a duty both dangerous and unsatisfactory. Modern tanks are now being equipped with radio, the company and section commanders having both receiving and short-wave transmitting sets, while the other tanks

Controlled by RADIO



are only equipped to receive. The illustration shows a tank company advancing to clear the way for the infantry. The tank in the foreground is cut away to show the driver and the company commander seated in the turret. The commander has spotted the camouflaged pillbox in the left foreground and is sending an order by radio to the tank on his right to turn and smash the emplacement. Tanks shown here are armed with machine guns, other types are equipped with small cannon.

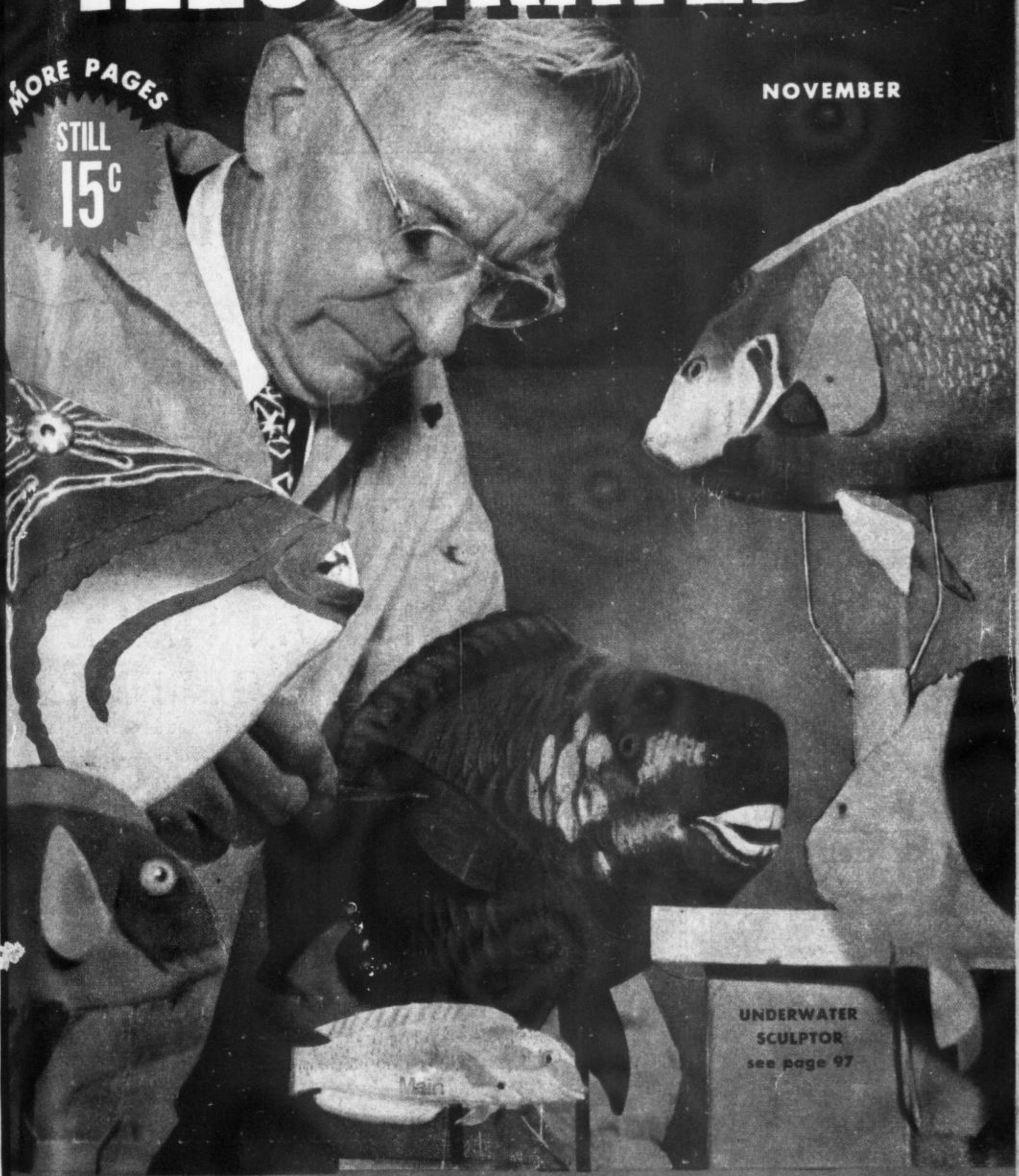
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UNDERWATER
SCULPTOR
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DOES THE ELECTRIC CHAIR KILL?

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NOVEMBER, 1946

VOL. XXXVII No. 1

On the cover: Color photo of Chris Olsen, by Leeser, Camera Clix

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TORPEDO

BY ORRIN WRIGHT

You steer from the center and cruise at 100 in this new rear-powered car.

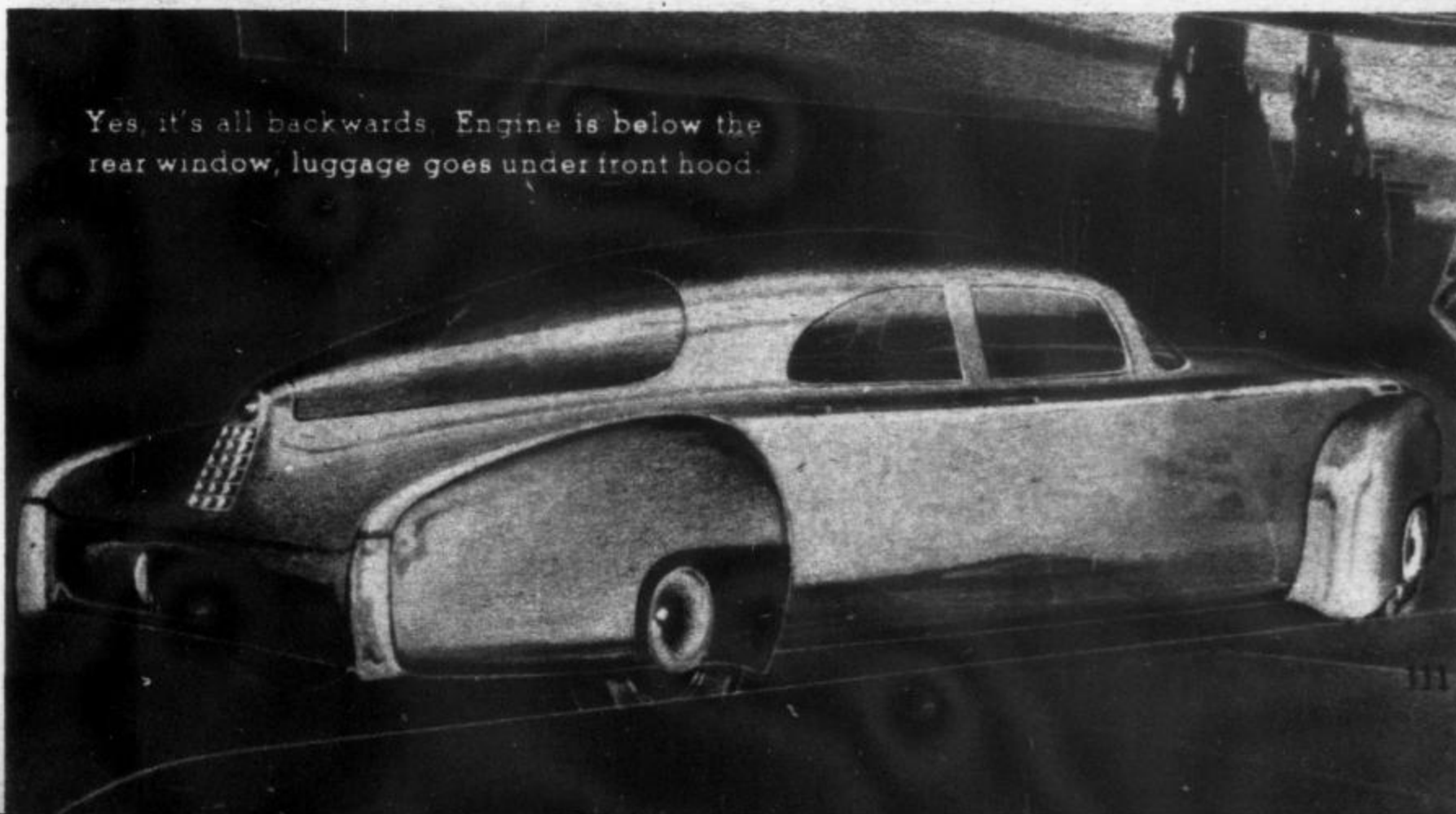
DAREDEVIL speeds of yesterday will be only moderate Sunday afternoon clips to tomorrow's conservative driver in the new passenger car designed by Preston Tucker, nationally-known engineer and race car builder.

Tucker calls his new creation the "Torpedo." It is designed to cruise with safety at 100 miles per hour and has many features never before built into a passenger automobile.

Among the Torpedo's most unusual features are center steering, fenders and front wheels mounted as units so that the fenders turn with the wheels, rear engine with "torque converter" power transmission, disk-type brakes and a sealed cooling system.

The torque converter, which the designer says is the key to successful use of the engine in the rear, eliminates gear transmission and differential altogether.

Yes, it's all backwards. Engine is below the rear window, luggage goes under front hood.



Rear axles, which carry no weight, go direct from engine to wheels through aluminum castings which provide independent wheel suspension. The only controls on the floorboard are the foot throttle and the brake pedal.

The frame is designed of welded steel tubing, fabricated in a manner similar to that of an airplane fuselage. The overall weight of the car is 2,000 pounds.

The sealed cooling system operates under forced circulation, thermostatically controlled. In winter, a part of the radiator heats the interior of the car.

The Torpedo has a fuel injection motor similar to those used in airplanes. Direct injection reduces idling speed and boosts power, Tucker claims.

The block is a single aluminum casting

combining the cylinder and water jacket. The pistons are of aluminum of the same coefficient of expansion, which reduces ring wear and prolongs engine life.

The Torpedo has three headlights. Two are mounted in the fenders and swing with the wheels. The third is in the center and stays fixed straight ahead. A photoelectric cell automatically dims the lights when another car approaches.

Tucker's reason for mounting the steering wheel in the center is that his racing experience has shown that a fast moving vehicle cannot be properly controlled with a side steering wheel.

As another measure of safety, he has installed throttle controls which hold the speed down until new drivers, unaccustomed to rear-engine power, learn how to judge speed accurately.

Three sit in front. Individual side seats swivel out of driver's way as doors open.

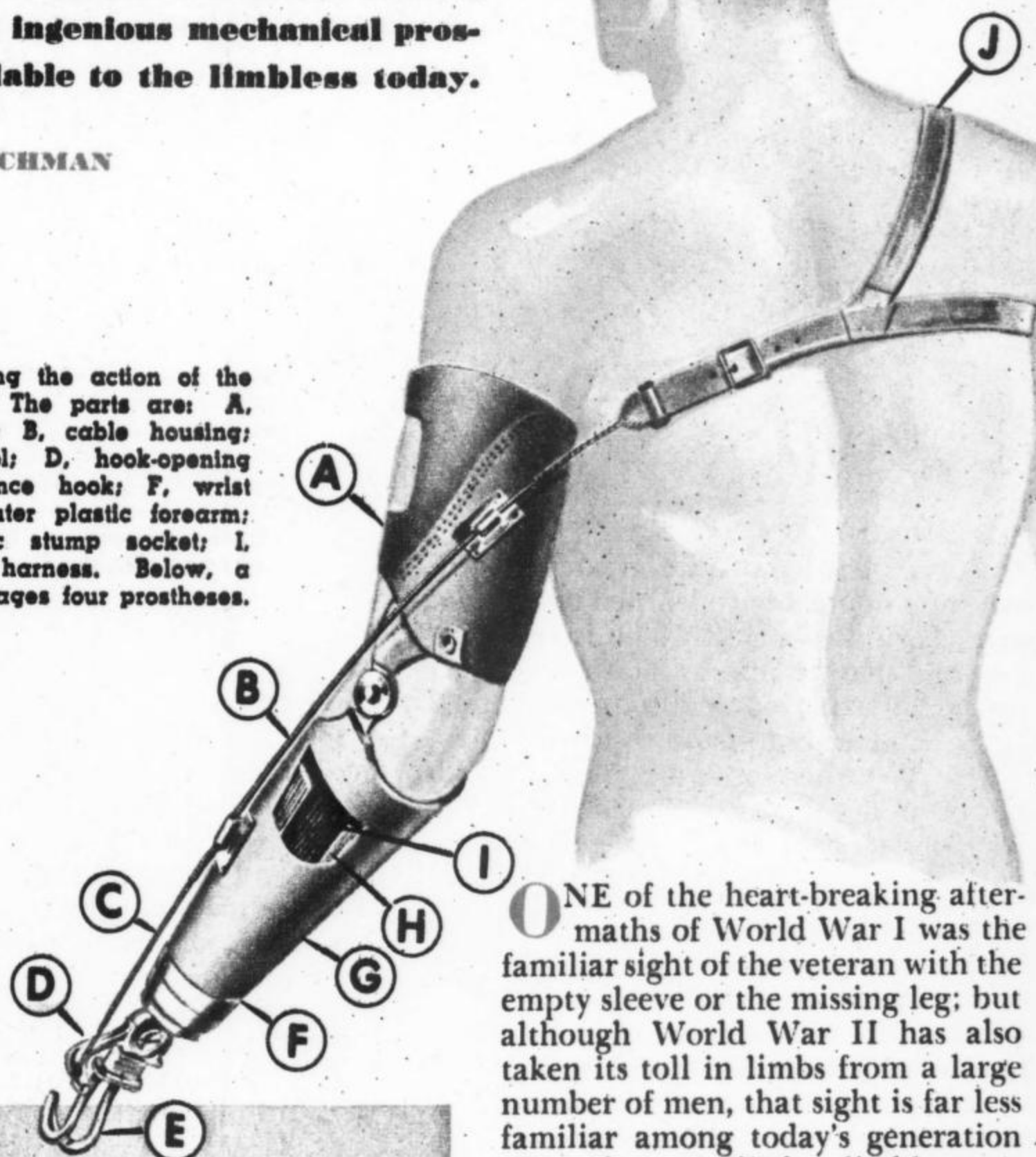


LIMBS TO ORDER

A far cry from former hooks and wooden legs are the ingenious mechanical prostheses available to the limbless today.

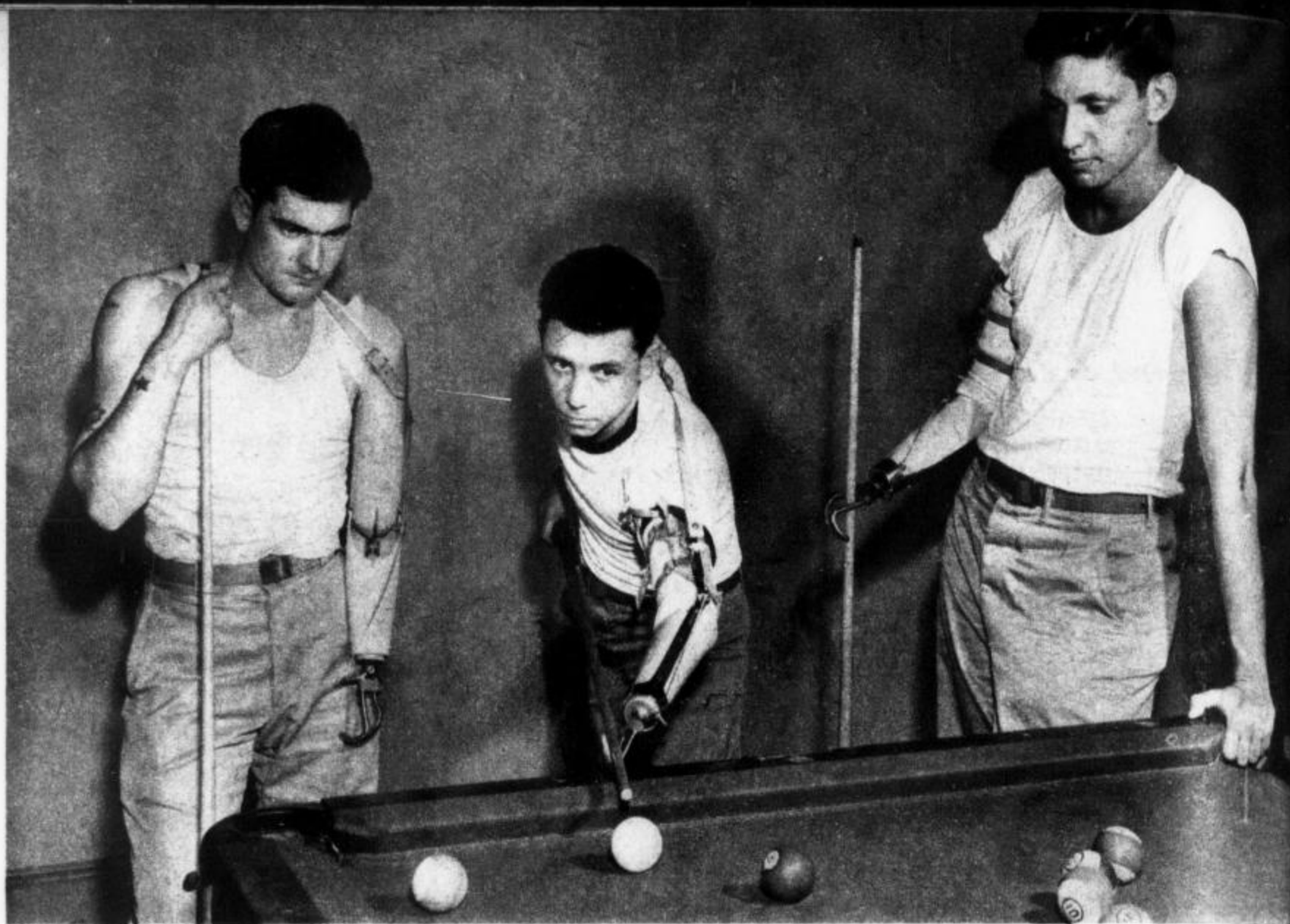
BY LOUIS HOCHMAN

Drawing revealing the action of the Dorrance hook. The parts are: A, corset assembly; B, cable housing; C, cable control; D, hook-opening lever; E, Dorrance hook; F, wrist assembly; G, outer plastic forearm; H, inner plastic stump socket; I, stump sock; J, harness. Below, a patient who manages four prostheses.



ONE of the heart-breaking aftermaths of World War I was the familiar sight of the veteran with the empty sleeve or the missing leg; but although World War II has also taken its toll in limbs from a large number of men, that sight is far less familiar among today's generation of war heroes. Today, limbless veterans walk, dance and skate on artificial limbs with miraculous ease and dexterity. Men who have left arms on foreign battlefields manage most of their daily chores with ingeniously designed artificial arms. They function so naturally with their prostheses that they can perform efficiently any task they set out to accomplish.

In the past it was not always possible for amputees to be fitted with jointed artificial limbs relatively soon after amputation, but great strides have been made both in the treatment of amputations and the development and fitting of pros-



Their prostheses do not prevent these vets from shooting a good game of pool.

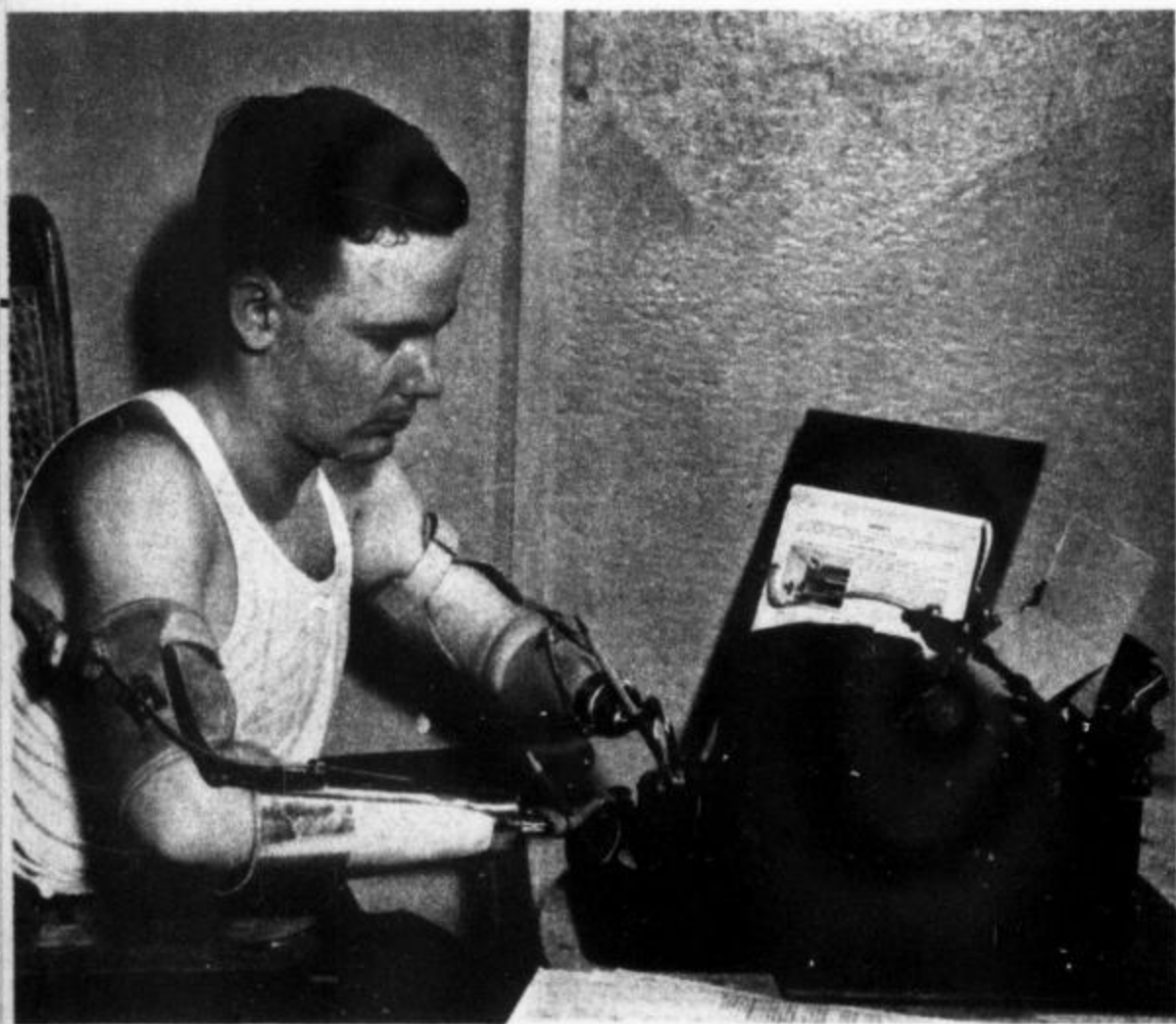
theses, so that today a far greater percentage of amputees have learned to walk on artificial limbs—a skill which is very difficult and may be impossible to develop if too great a period of time has elapsed between amputation and the fitting.

Use of the peg leg as a temporary limb has been largely discontinued due to the bad walking habits it encouraged. Instead, patients are fitted with a jointed artificial limb which, being adjustable, can be applied soon after the final surgery is done. This is probably the greatest advance that

has ever been made in the handling of amputations.

To simplify and speed up the manufacture of the limbs, the Army has adopted wood fiber prostheses, which can be made in quantities, in assorted sizes. Light and durable and embodying the best mechanical principles, they lend themselves readily to adjustments of all types, and mechanics can be trained by experienced limb fitters to adjust them in a fairly short time. Each amputation stump must be fitted individually in the limb shop—usually from a plaster mould.

Just how the artificial limbs work is a big mystery to the average layman. How does a legless individual manipulate the mechanism of his alien member with only a stump? The secret lies first in the delicate balance of the leg's construction, then in the strap fittings and the pelvic belt control which regulate its movements. In order to make the movements as natural as possible, many improvements were made in the construction of



This chap types very well. Note the hook-held pencils, to soften the touch.

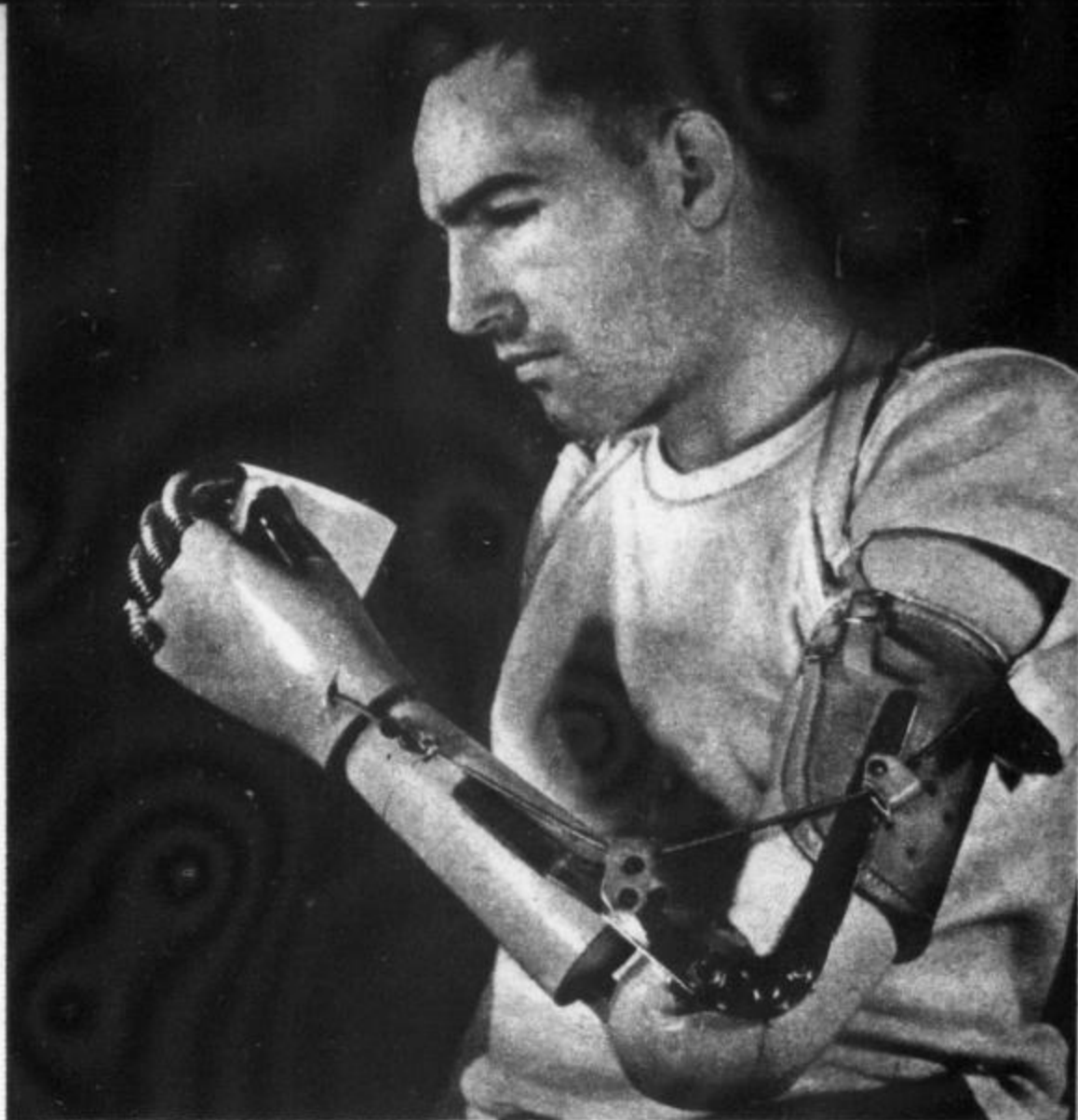
the knee, ankle and toe joints.

The latest knee joint is made of aluminum with a built-in friction brake and roller strap control. These features, being adjustable, make it possible to stiffen or loosen the swing of the shin to suit the walk of the individual wearer.

The new aluminum ankle is one-third the weight of the old fixed wooden one, and has a self-adjusting toe-out feature for people who walk either slightly toed-in or toed-out, thus making for more stable balance. The toes have rubber-cushioned joints, hinged with leather underneath, to give them the natural bend when walking.

The patient with an above-knee amputation, fitted with such a limb, walks with the same muscular motion of his former natural limbs. His stump fits into a new type of thermo-

Pfc. Green's so used to his arm that he forgot to take it off, one night!



This photo was taken at a dance, the trouser legs being raised only for the camera, to show the prostheses.

November, 1946

setting plastic stump socket which has been found to be more durable than wood, lighter and more sanitary than leather, and to have less than two percent moisture absorption. The pelvic belt control, a stiff belt with a jointed metal brace connected to the limb, fastens around the patient's hips and controls the turn of the limb with the pivot of the body. It also holds the limb to the stump when the limb is lifted.

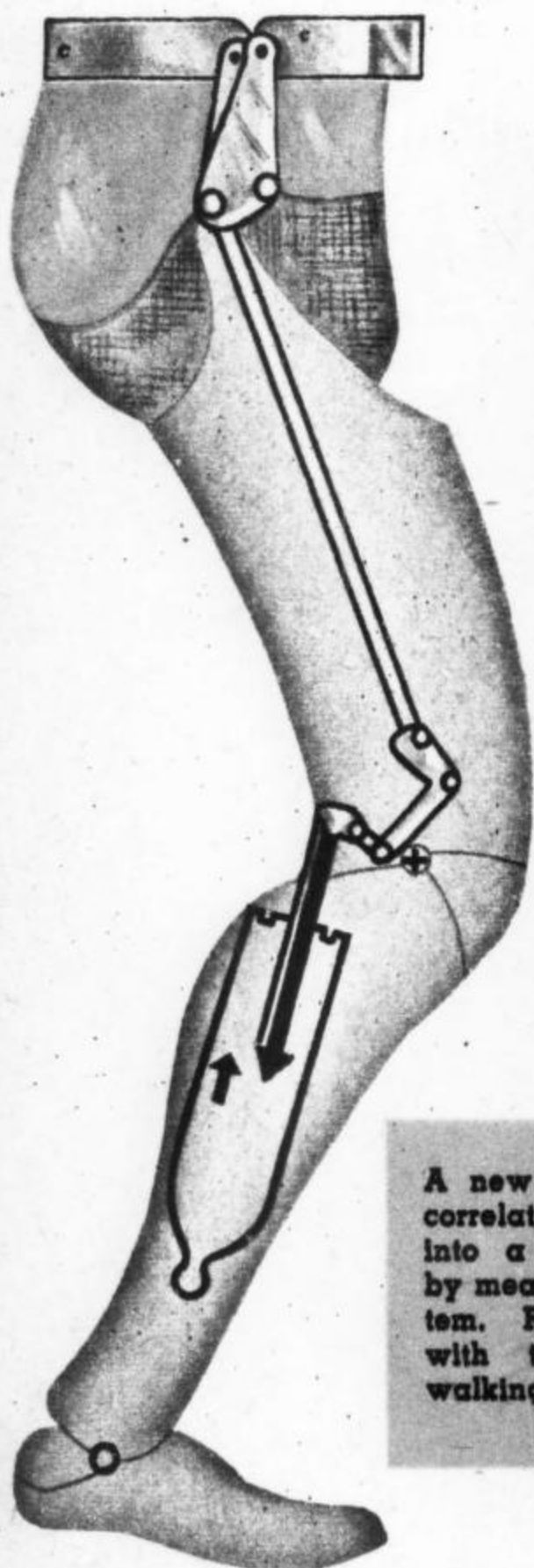
When he walks, he leads off with his good leg, then by lifting the stump, the knee joint bends and elevates, raising the foot off the ground. As he swings his stump forward, the elastic forked strap, running from the front of the pelvic belt control to the artificial shin, pulls the shin forward until the brake, or the tight pivot joints in the knee, stop its forward swing. The leg is now extended forward and the

patient can set down on its heel. As the heel hits the ground, the backward ankle action permits the foot to come down flat. The patient then rolls forward on his limb. The ankle joint pivots until the shin is at a 90-degree angle with the foot, then locks, forcing the walker to the ball of the foot and compressing the toe action. The heel thus raised keeps his shoulder on an even plane.

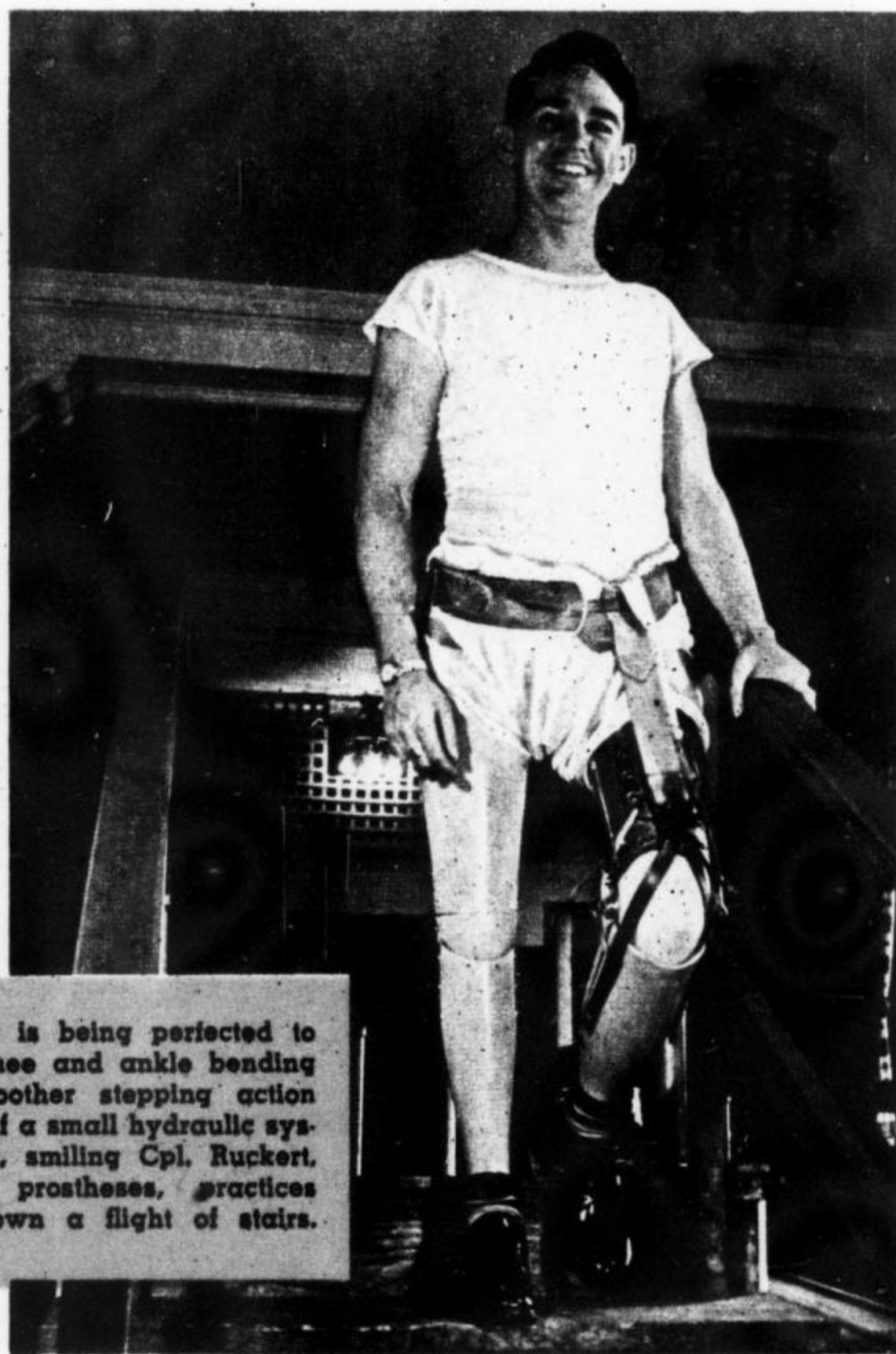
When standing on the artificial limb, the amputee's weight rests on the rim of the stump socket.

A patient with a below-knee amputation has a limb with similar mechanical controls, the knee joint being eliminated and the limb attached directly to his thigh by means of a leather corset.

The GI who has lost an arm generally finds himself more handicapped than the one without a leg. Improvements are con-



A new leg is being perfected to correlate knee and ankle bending into a smoother stepping action by means of a small hydraulic system. Right, smiling Cpl. Ruckert, with two prostheses, practices walking down a flight of stairs.



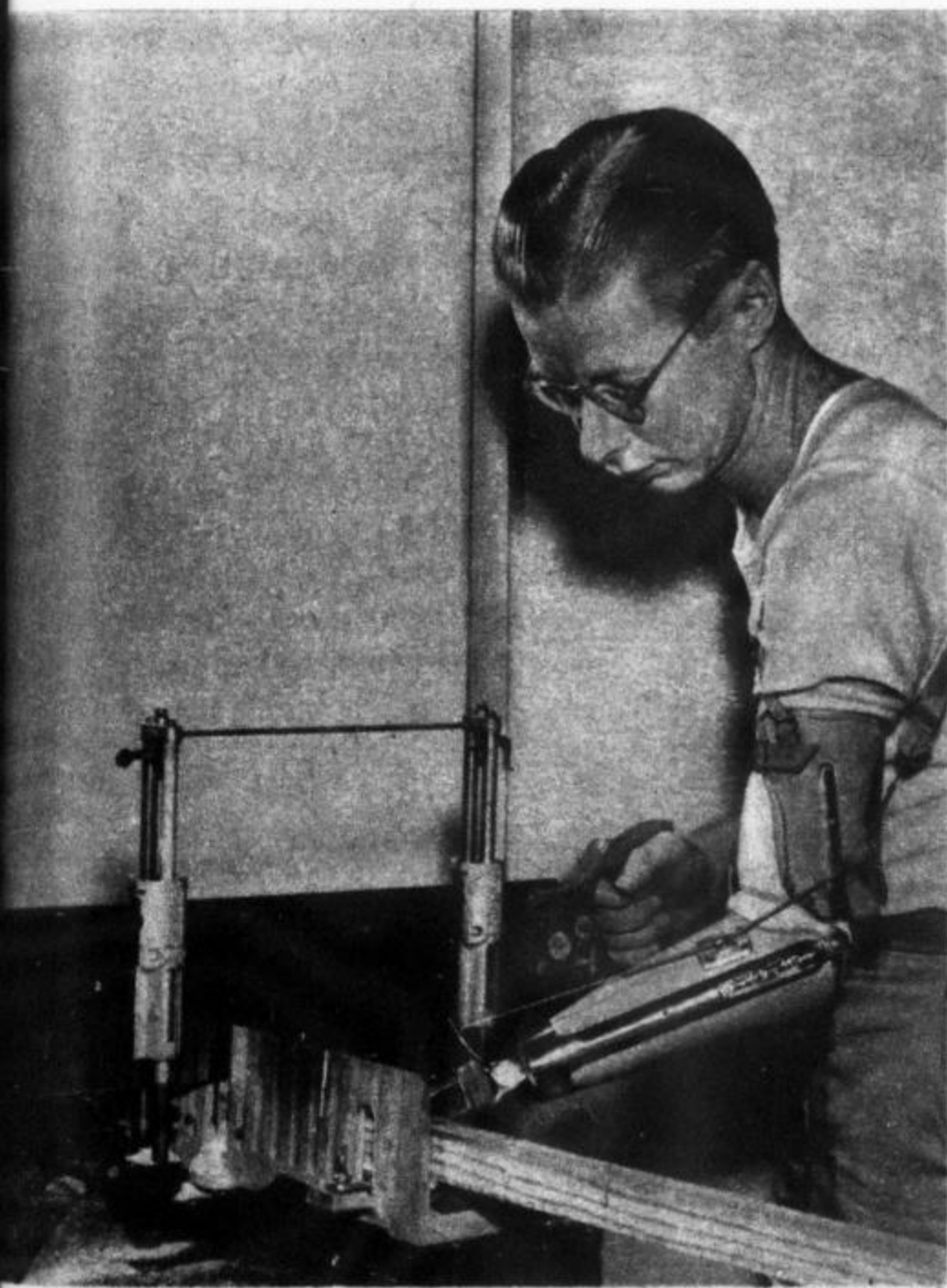
stantly being made in the artificial arms provided, however. Today, fitted with a mechanical hook which he controls by means of a cable attached to his opposite shoulder, he can accomplish many of his daily chores, such as dressing himself, buttoning his clothes, handling a knife and fork, writing, turning door knobs, dialing telephones, and so on. If he has even so much as two inches of bone below the elbow he can execute an amazing number of arm movements.

The hook, which has been found to be the most useful design, is a hinged affair, double, held tightly closed with rubber bands. When the amputee wants to pick up something he first opens the hook by moving his opposite shoulder forward (the cable ends at a projecting lever on the hook), then, by relaxing his shoulder, allows the hook to close on the object. The

hook is set in a tight swivel fitting, and the patient uses his good hand to turn the hook to the desired angle. Above-elbow amputees bend the artificial elbow by means of a cable control from the opposite shoulder, and the elbow can be locked.

Some artificial arms have wrist attachments which adapt the arm for many types of work. The hook can be removed and a small chuck fitted into its place. This chuck will accommodate such specially designed attachments as a knife and fork, nail file, hooks, and hair brush.

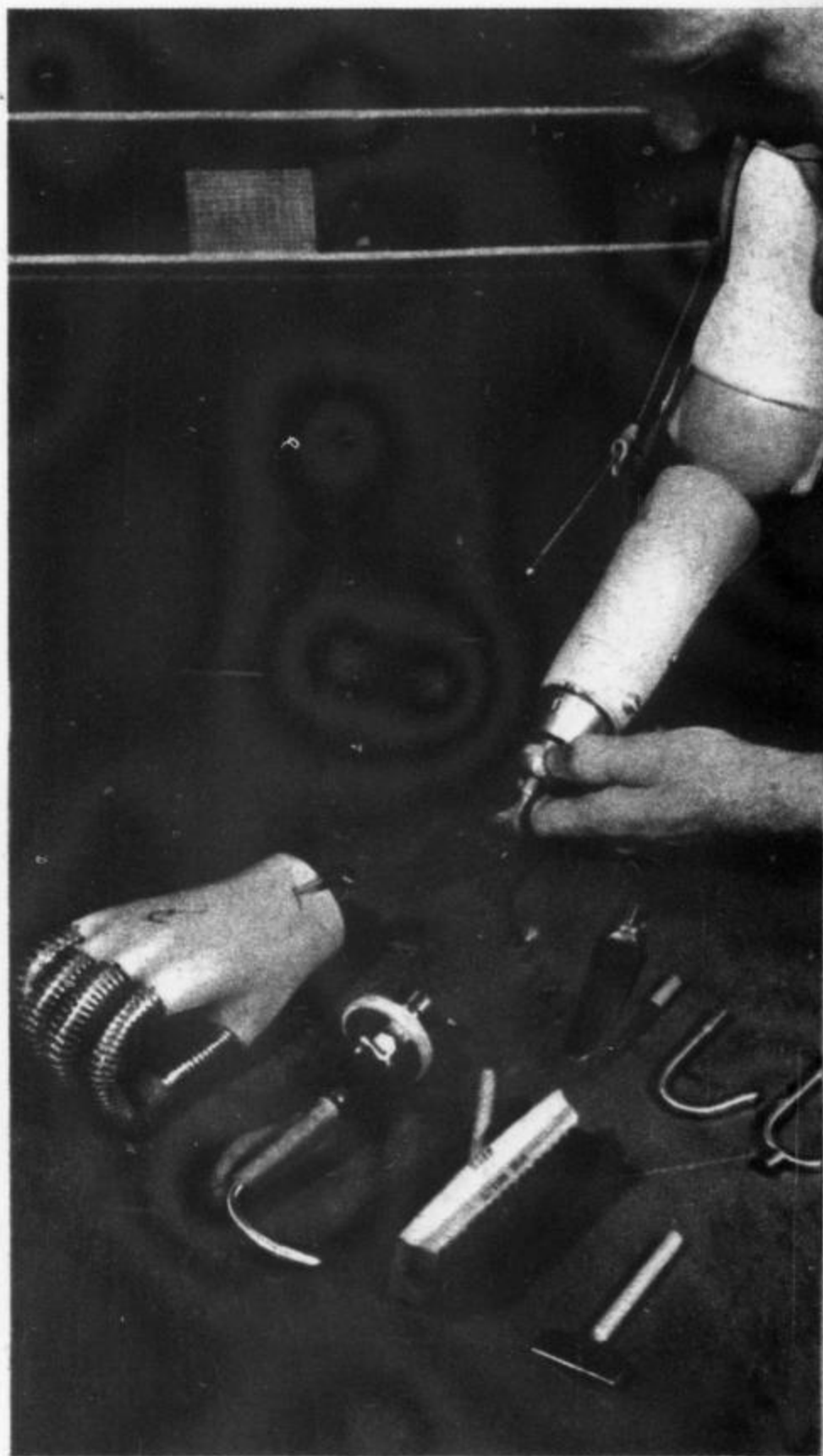
These and many other refinements have been and still are being worked on at the Thomas M. England General Hospital and other military amputation centers where scores of amputees come in on litters and walk out on new, made-to-order limbs, to again stand with others on an equal footing in this competitive world.



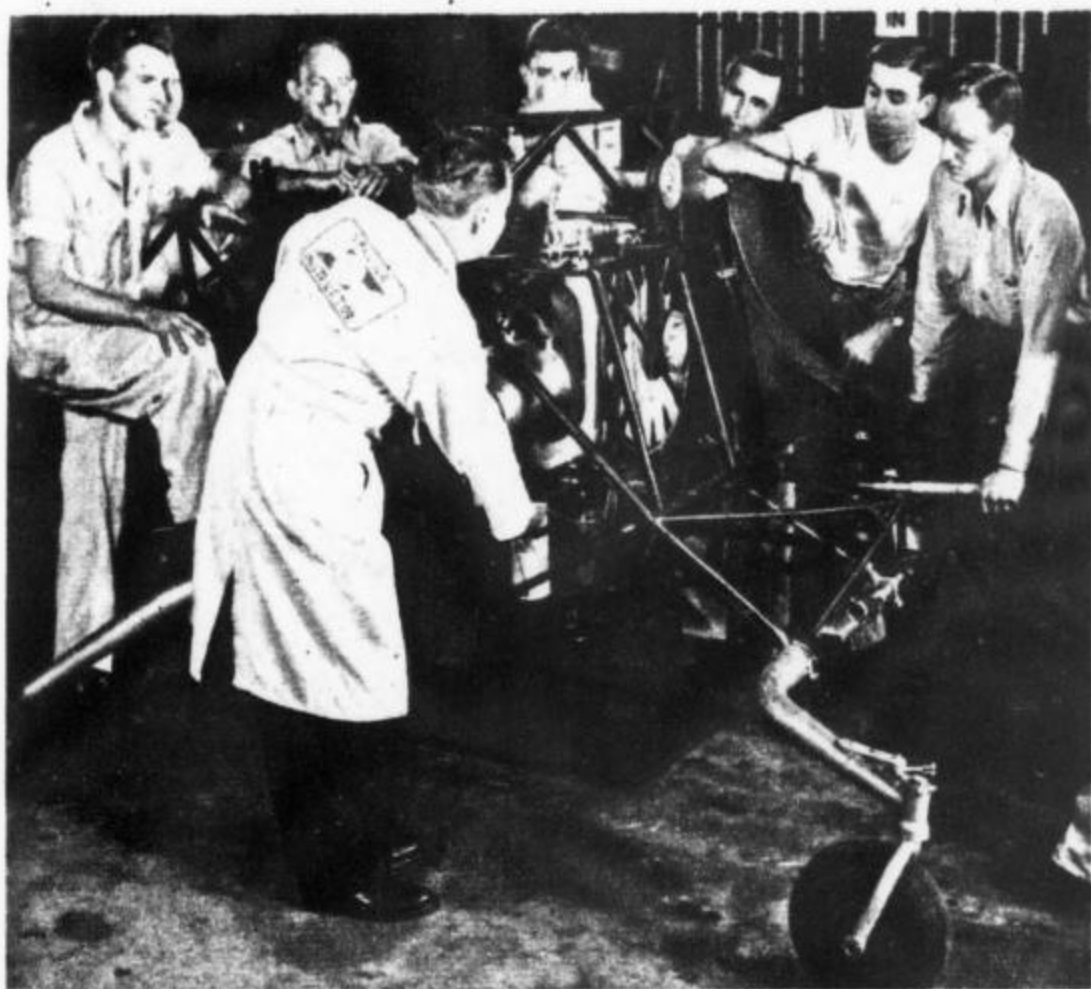
Above, sawing with a mitering unit. There's very little that a man with an artificial arm can't do.

There's a chuck in the wrist of the prosthesis. Into it can be fitted every one of these attachments.

November, 1946



Pinwheel Alma Mater



BY C. B. COLBY

Pilots from all over
the world are growing
humming-bird wings at
the 'Copter College.

The anti-torque prop keeps you from whirling around like a top, as the prof explains above. Left: Students ponder the helicopter's power plant.

IF YOU have a secret yen to fly up to the graduation platform and receive your "sheepskin" as you hover over prexy's head, the place to try it would be at the graduation exercises of the Bell Helicopter Flight Training School at Niagara Falls, New York.

This exclusive aviation school, under the able direction of Milo H. (for Helicopter?) Miller, is the only one of its kind in the world. Its student body is hand picked and selected not only for flying ability but with an eye to each individual student's potentialities as a future good will ambassador for the rotating wing in-

dustry during its anticipated growth.

Located at the Bell Aircraft Corporation's plant, this school which boasts of "classrooms with rotating roofs" is open to any selected pilot holding a CAA Commercial license and \$1,500 he wants to invest in a bright future.

Many of the pinwheel graduates will be employed by the Bell company itself as pilots for various models of helicopters, while others will be employed by private helicopter owners, feeder lines, crop dusting and spraying organizations. For this reason it is a "must" that the students already hold CAA Commercial tickets.

The selection of the students, all other qualifications being equal, depends upon their character, integrity and interest in the future of helicopters. Applicants have sent in their requests for enrollment from practically all over the world. Sweden, Brazil, Chile, Canada, and even Egypt are represented.

Once selected—and the sending in of an application by no means guarantees that the applicant will be accepted by the Bell student selection board—the student begins a serious and highly complete six to eight weeks' course both in the classroom and in the cockpit.

The classroom work must be completed and absorbed in every detail as the student progresses. Such things as construc-

tion, theory of rotating wing flight, engines, torque effect, gyroscopic effect, methods of control, coning, flapping hinges and all other phases of helicopter flight are minutely covered. The progress and assimilation of the instruction is checked repeatedly as the class work progresses so that there may be no "cone of silence" in the student's knowledge of the helicopter's peculiar characteristics such as hanging in one spot like a humming bird.

Once the classwork is over and the student knows every angle outside the cockpit, the flight training begins.

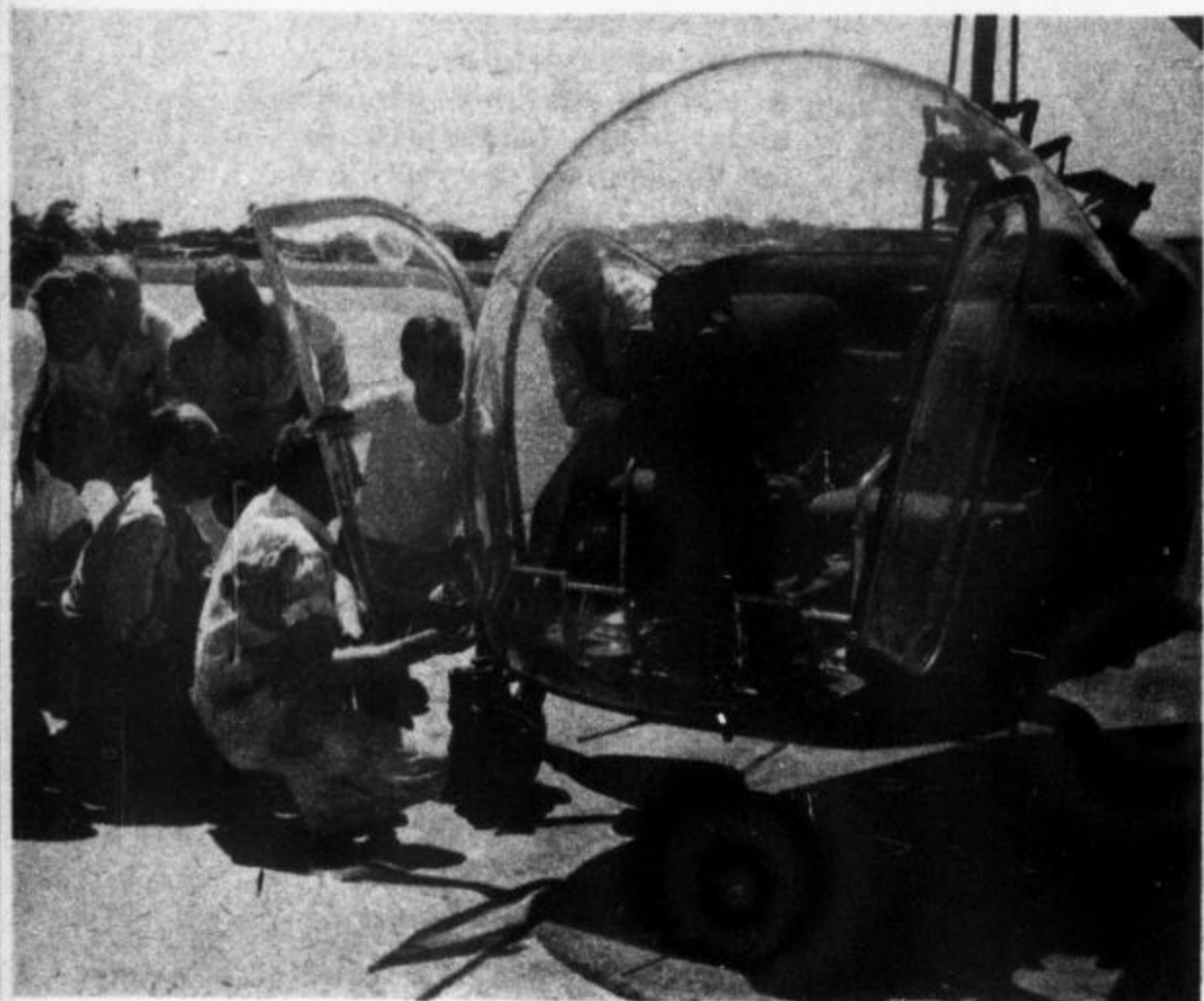
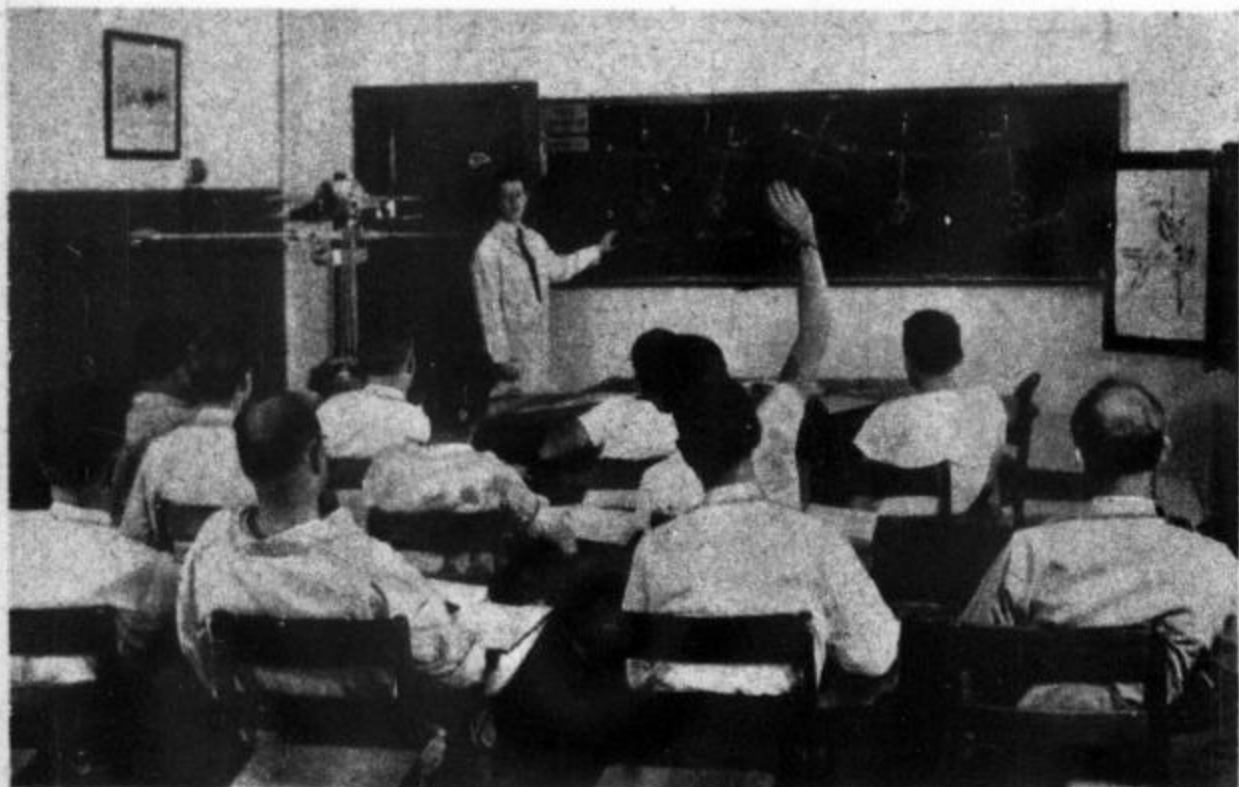
Under the expert direction of Chief Instructor Joe Dunne, who has flown well over 500 hours in helicopters, and Instruc-

tor Art Nelson, another veteran rotating wing pilot, the student begins the real thing.

First of all comes the "cockpit drill" to familiarize him with the controls and cockpit layout. This is important for there are instruments new to the pilot of conventional aircraft. Extra controls, new instruments and a stick-grip throttle, similar to a motorcycle throttle, must all be thoroughly understood and mastered.

The instruction helicopters are equipped with wide-angle, clear plastic bubble noses for maximum visibility, and of course dual controls.

Maximum visibility is doubly important in a helicopter, for a global sphere of flight demands that the pilot, particularly the student, be able to recognize instantly a change of direction and the speed of the change regardless of his altitude or surroundings. Flying along a few inches (yes, inches) above the ground at high speed, as may be safely done in a helicopter, requires perfect visibility and a well-



Students first learn of the strange bird in class, then meet him in person. Hmm . . . he has an honest, open face.

trained pilot, hence the design of the training ships and the thoroughness of instruction.

The flight instruction at the Bell school includes everything from one-spot hovering to spot landings by autorotation—dead engine and rotor blades revolving freely as a pinwheel. Jump takeoffs, rectangular patterns of flight, power glides, banked spiral climbs and glides, and simulated "high altitude" or overload landings and takeoffs are part of the curriculum. Nothing is left for the pilot to learn by himself. Even such things as icing, fire, hot and cold weather operation, power failure, tail rotor failure and ditching procedures are covered.

At present the classes are small by choice, four or five students to a class. This is in keeping with the Bell policy of individual attention and check on the student's progress. Students must show aptitude for rotating wing aircraft pilotage. Aspirants who do not possess or show this aptitude are eliminated during the first hours of the course and released from enrollment with a partial refund of the fees paid. Applicants must agree to complete the course, once accepted and started, for there is no half-way training

in helicopter flight at the Bell school.

The subject-matter is covered in about 75 hours of classwork instruction, observation, and work in maintenance and servicing of the aircraft. Every modern means and training aid is used to clarify and aid in the work. Drawings, movies, mockups of full size scale models, electric motor-powered flying models and other media are liberally employed.

For those ex-service pilots who have attended Army, Navy or Coast Guard helicopter schools, the schedules have been condensed into a refresher and familiarization course. This course is shorter, 30 hours of class instruction as compared with 75 hours for the original course and 10 hours of flight training as compared with a maximum of 30 for the inexperienced pinwheel pilot, but it covers the same material. It is mainly a familiarization course to acquaint the ex-service pilot with the Bell machines and their servicing.

As in the full length course for the tyro helicopter pilot, the condensed course fee does not provide for living quarters, meals, or transportation to and from the plant. These must be arranged by the students themselves.



Coming in for a vertical landing after the first solo flight.

AUG.

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LOST GOLD TREASURE HUNTS

Sanders

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MODERN MECHANIX AND INVENTIONS

Donald G. Cooley
EDITOR

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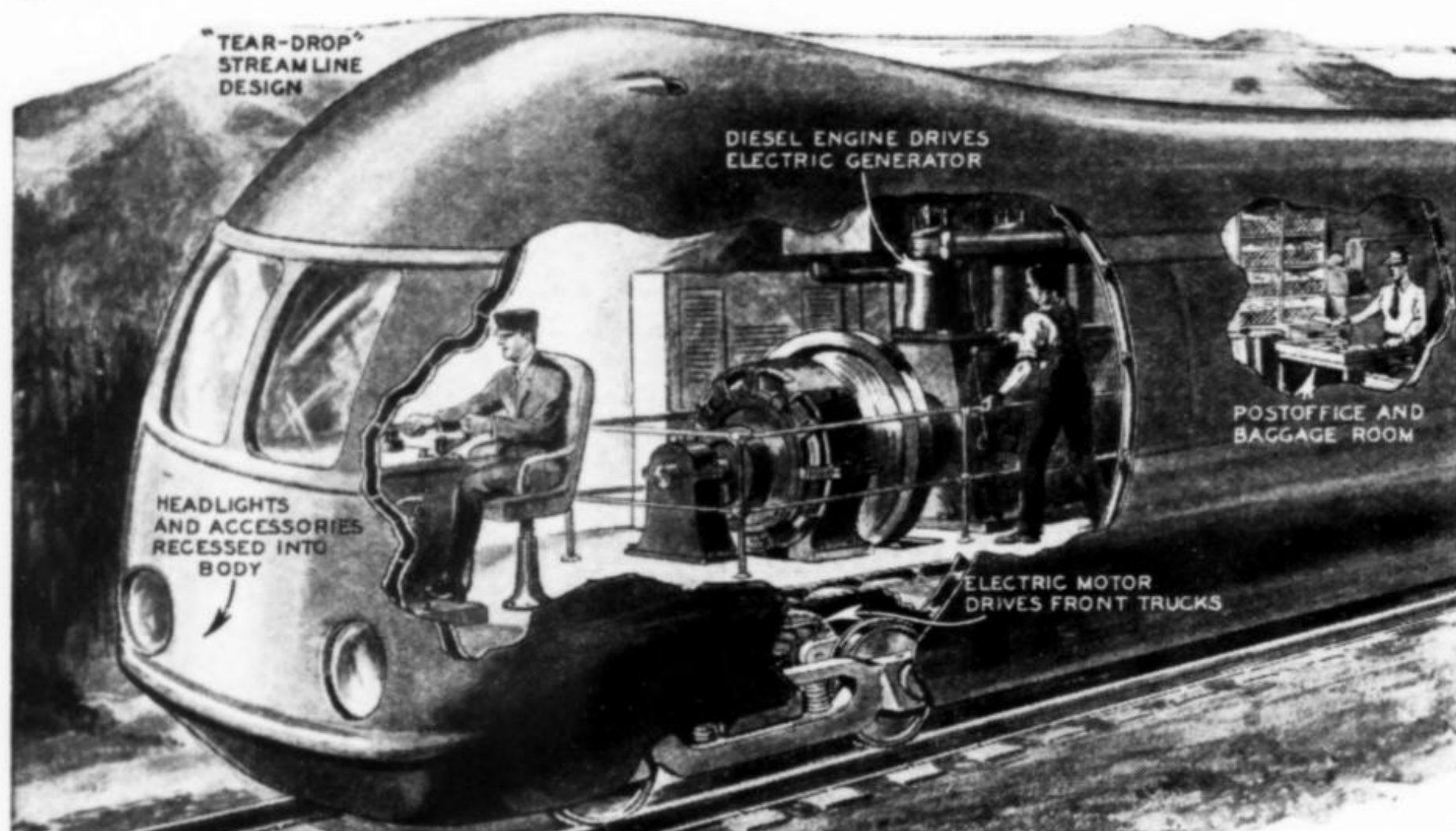
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Streamline TRAIN Heralds



Features of carefully streamlined train under construction for Union Pacific Railway are given in drawing. Note clean, cinderless power mechanism—Diesel engine hooked to generator and motor on front trucks. At left, three-car streamlined train weighs no more than ordinary Pullman.

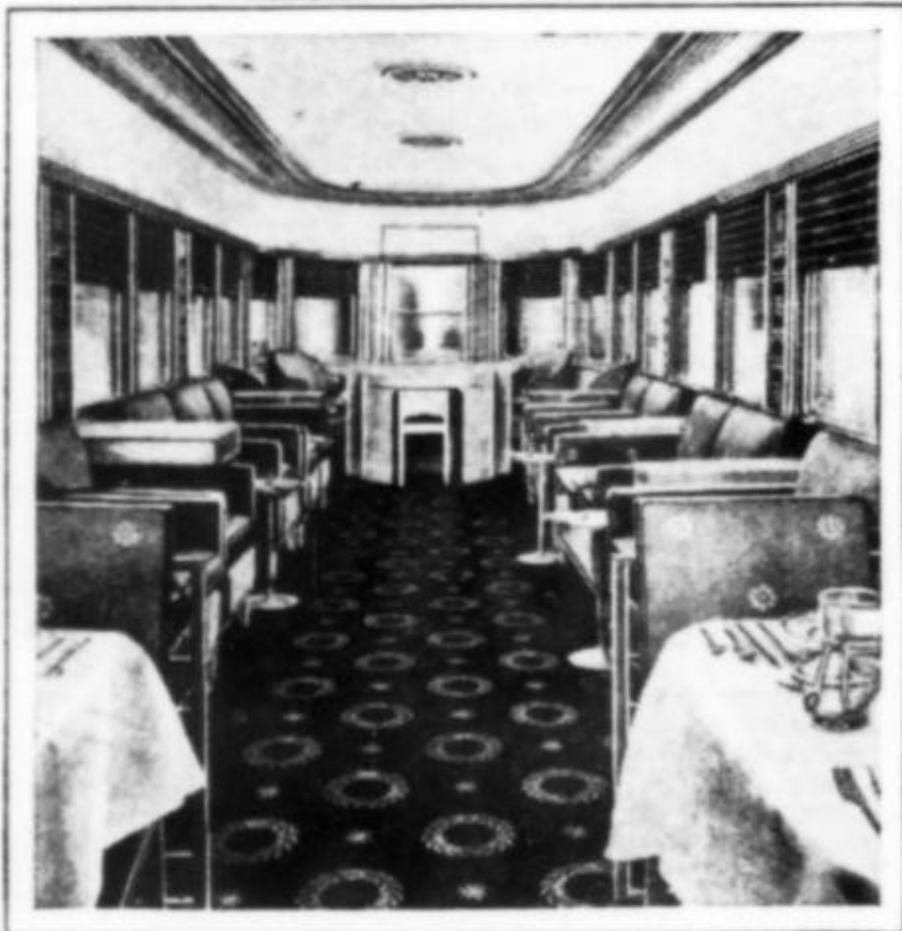


by ROY DEAN

Super-speed railway trains are here—rivaling airplanes in swiftness, gliding along in luxurious silence, resembling trains no more than the Leviathan looks like the flagship of Columbus. An amazing new era in railroad transportation is forcing present-style trains toward the junkpile. The "why" of this astonishing revolution in travel style is given in this absorbing article.

A FEW months ago MODERN MECHANIX AND INVENTIONS published an article calling attention to the need for an entirely new type of railroad train which would give passengers cool, clean, quiet transportation free from the annoyances of cinders, blasts of desert air from outside, the jerking and swaying of cars in motion, and the endless click of wheels against rail joints.

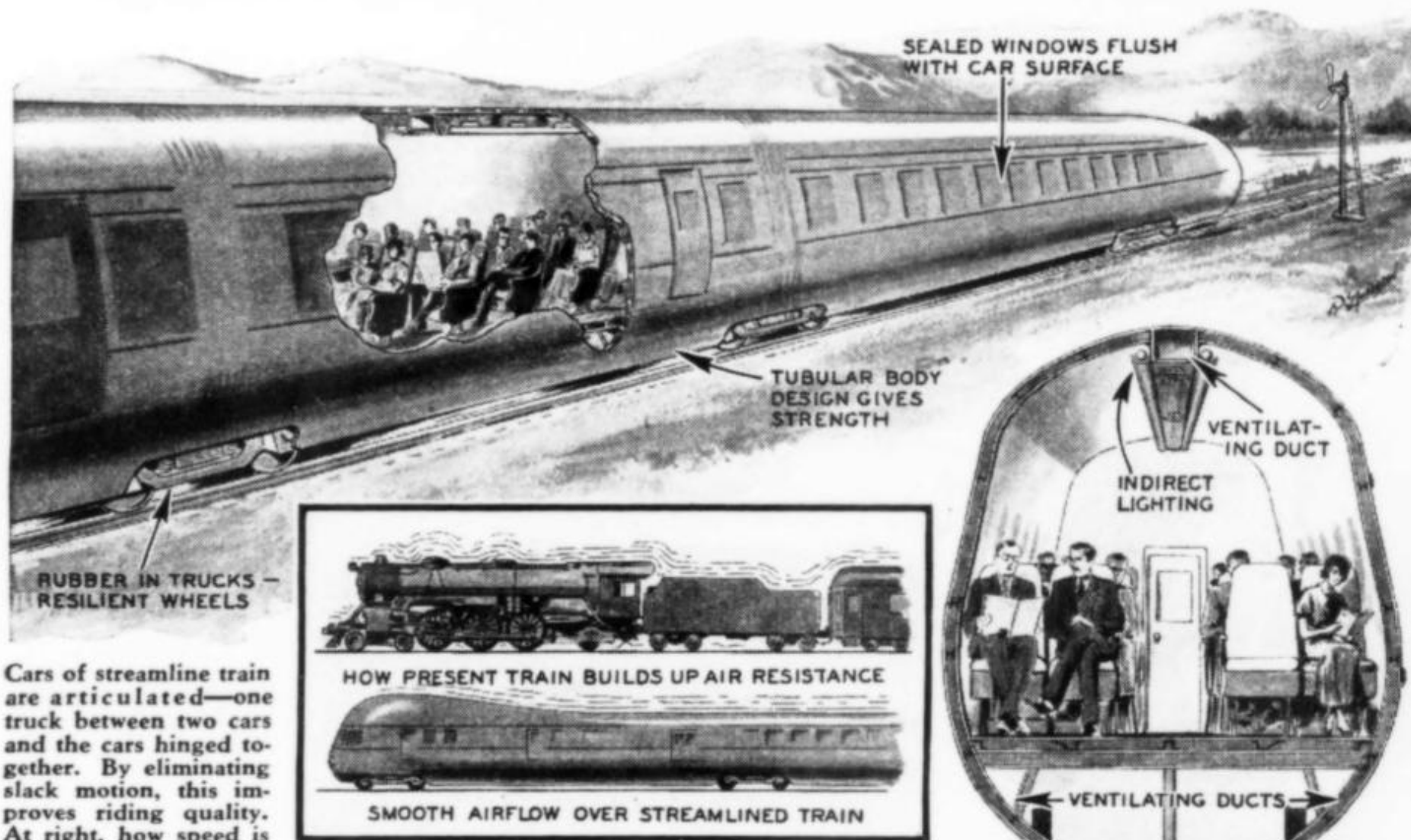
Now such a train is in actual process of construction for the Union Pacific Railway, and transportation experts are unanimous in the opinion that its design opens up a new era in rail travel which will eventually force the heavy steel trains of today, with their fuming coal-burning locomotives, onto the scrap heap. A real revolu-



Interior of new aluminum Pullman car, weighing but half as much as conventional steel car. Note air ducts in ceiling.

Modern Mechanix and

New Era for RAILROADS



Cars of streamline train are articulated—one truck between two cars and the cars hinged together. By eliminating slack motion, this improves riding quality. At right, how speed is gained by streamlining.

tion in train design is well under way—belatedly enough, when one considers that except for size our present locomotives are not essentially different from those used a hundred years ago, and there have been few new principles in passenger car structure since someone thought of putting a roof over a floor on wheels.

Competition of automobile, bus, truck and airplane has finally forced the railroads out of their inertia, made them realize that plenty of passenger business is theirs to command if they furnish the public what it demands in the way of economy and comfort.

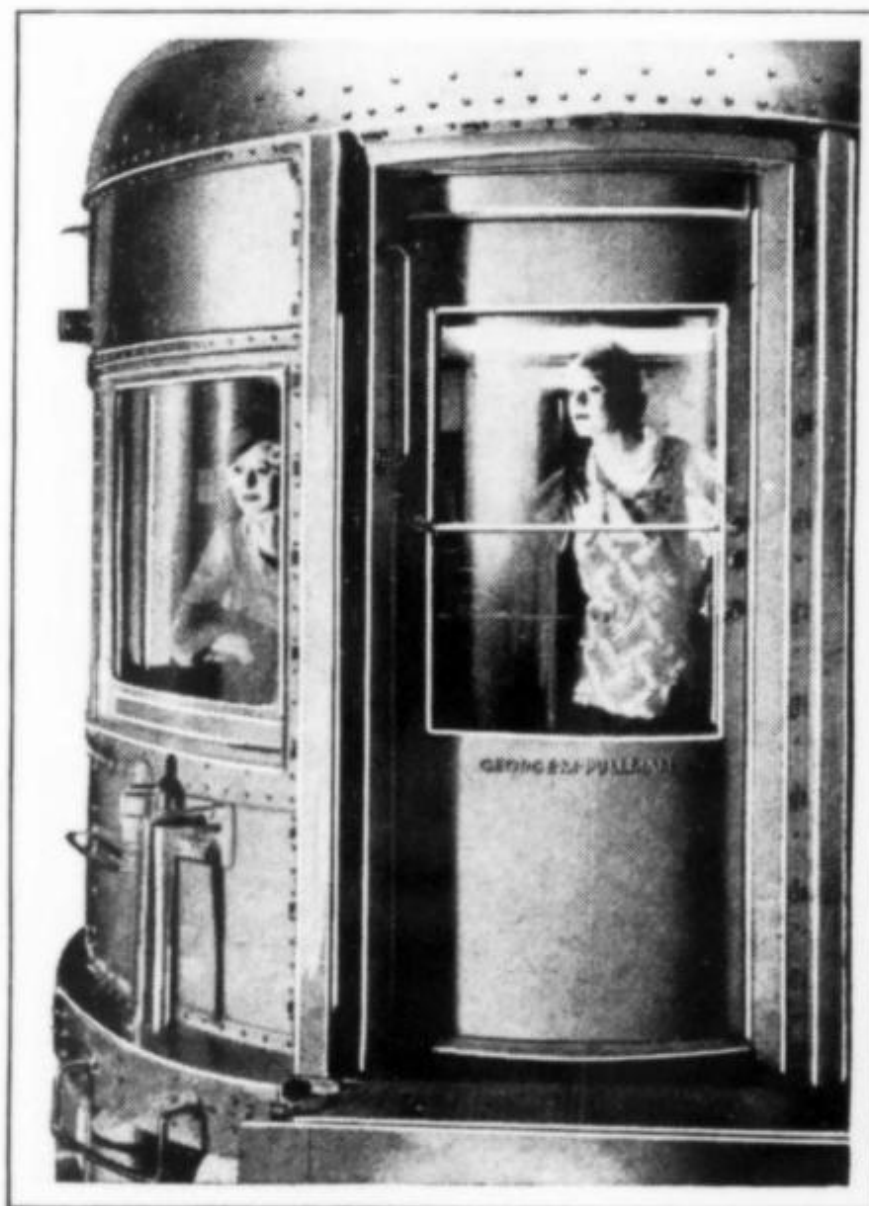
Power Needs Reduced by Half

That the Union Pacific train fills this bill to a T, there can be no doubt after a study of the design reproduced above. It is fully streamlined, and this, in conjunction with its light weight (the three-car train weighs no more than an ordinary Pullman) makes possible speeds of 110 miles an hour.

To the airplane is due the development of aluminum alloys which reduce weight two-thirds. Each car of the new train is tubular in shape, giving great strength. Streamlining of the train is carried farther than ever before, so efficiently that it is estimated power requirements at 100 miles an hour will be only half that required for conventional trains.

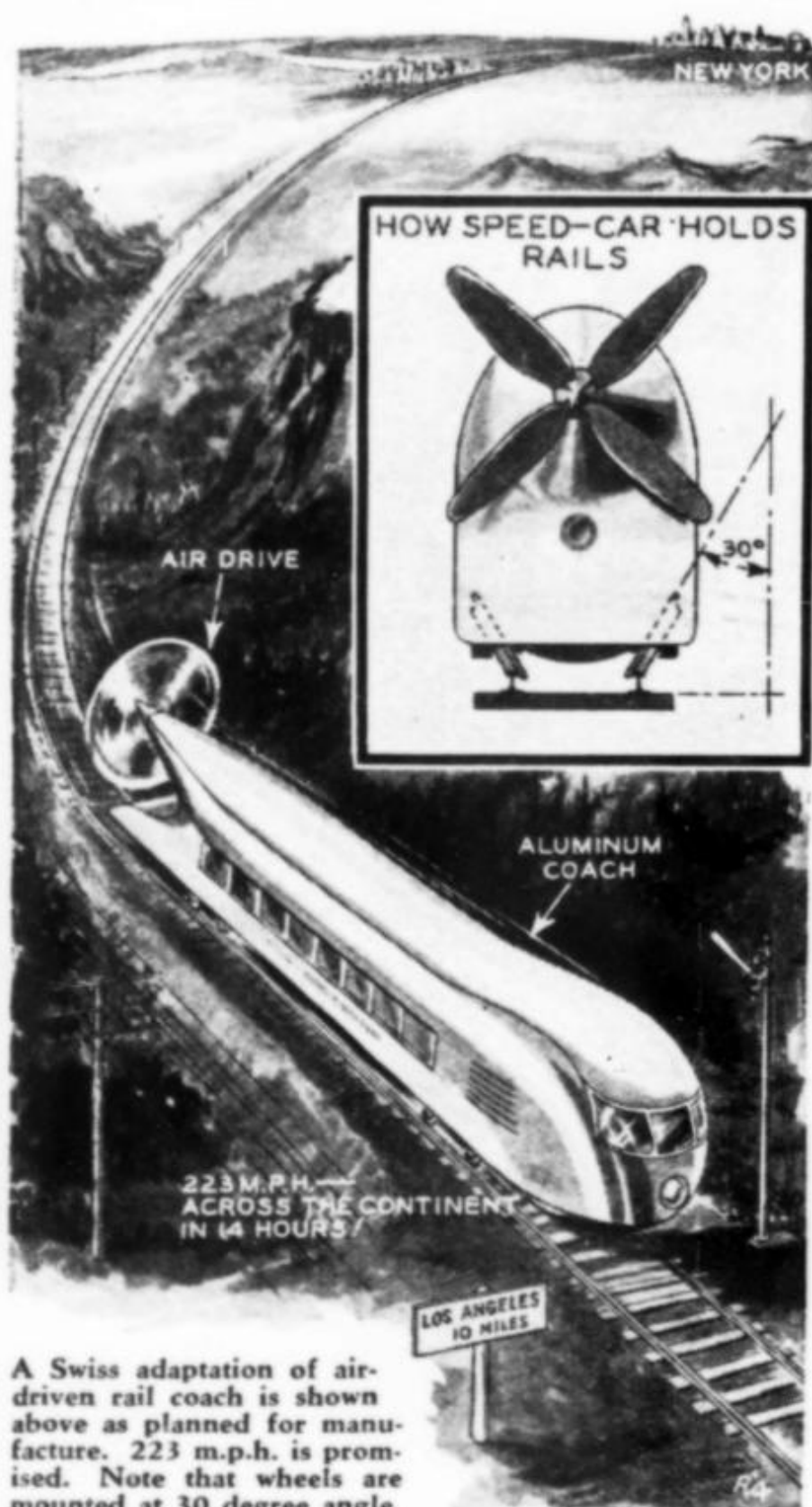
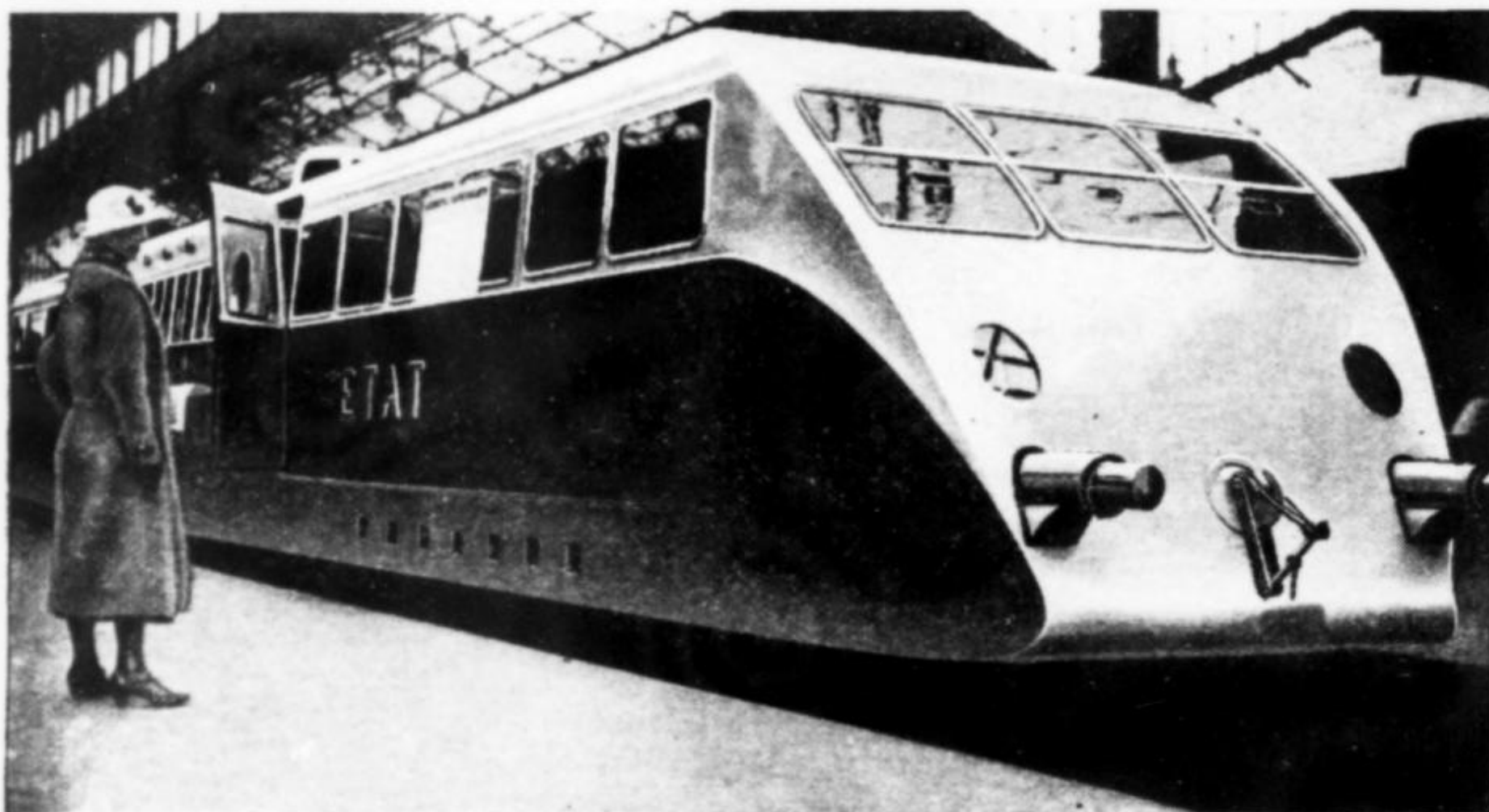
Windows are placed flush with the walls, vestibules between cars completely covered over, and headlights and other projecting units are recessed into the body. Outside air never enters the train. Three ducts keep

Right above, cross section of new train. Note the three ducts for forced ventilation of washed air. All cars are completely sealed against outside air. Note the tubular construction of body which gives great strength.



Rounded end of new Pullman car, interior of which is shown on opposite page. Steel, too heavy, is out of the picture in new railcars; light metal alloys take its place.

Europe Has Long Had Motor-Driven Trains Developing 100 M. P. H.



A Swiss adaptation of air-driven rail coach is shown above as planned for manufacture. 223 m.p.h. is promised. Note that wheels are mounted at 30 degree angle.

European nations have up to now set the pace in motor-driven trains. This "automotrice", whose 115 m.p.h. are said to make it the fastest rail motor in the world, seats 52 persons. It is shown in the Gare St. Lazare, Paris, France.

it perfectly ventilated; in summer the air is filtered and cooled, in winter, heated.

Silence comes from use of heavy body insulation, use of rubber in trucks, and a resilient wheel to absorb the impact of rail joints. Trucks are swung between each two cars, the front end of one car resting on the same truck which carries the rear end of the preceding car.

Power comes from a Diesel engine with direct connected electric generator and motors on the wheels of the forward truck. Thus smoke, cinders, and soot of the steam locomotive are entirely done away with.

So much for the Union Pacific train. It is now under construction and will be used to test its feasibility for transcontinental travel. It should be pointed out, however, that though this is by far the most advanced design of its type, European nations for some time have "had the jump" on us in developing motor driven trains.

Foreign Super-Speed Cars

A government-owned French railway has successfully tested a double-decked rail car at 125 miles an hour, with an 800 horsepower engine using benzol or alcohol. The Bugatti "automotrice," illustrated elsewhere in this article, has long been popular. In Germany, a Zeppelin car, streamlined and driven by an air propeller, has been in use for three years.

An air-driven car has been designed by a Swiss inventor which he claims is capable of 223 miles an hour. Although his car has not been constructed yet, because of financial difficulties, a study of his idea as reproduced with this article indicates that

Modern Mechanics and

Most Railway Speed Records (Regular Schedules) Are Held by Europe



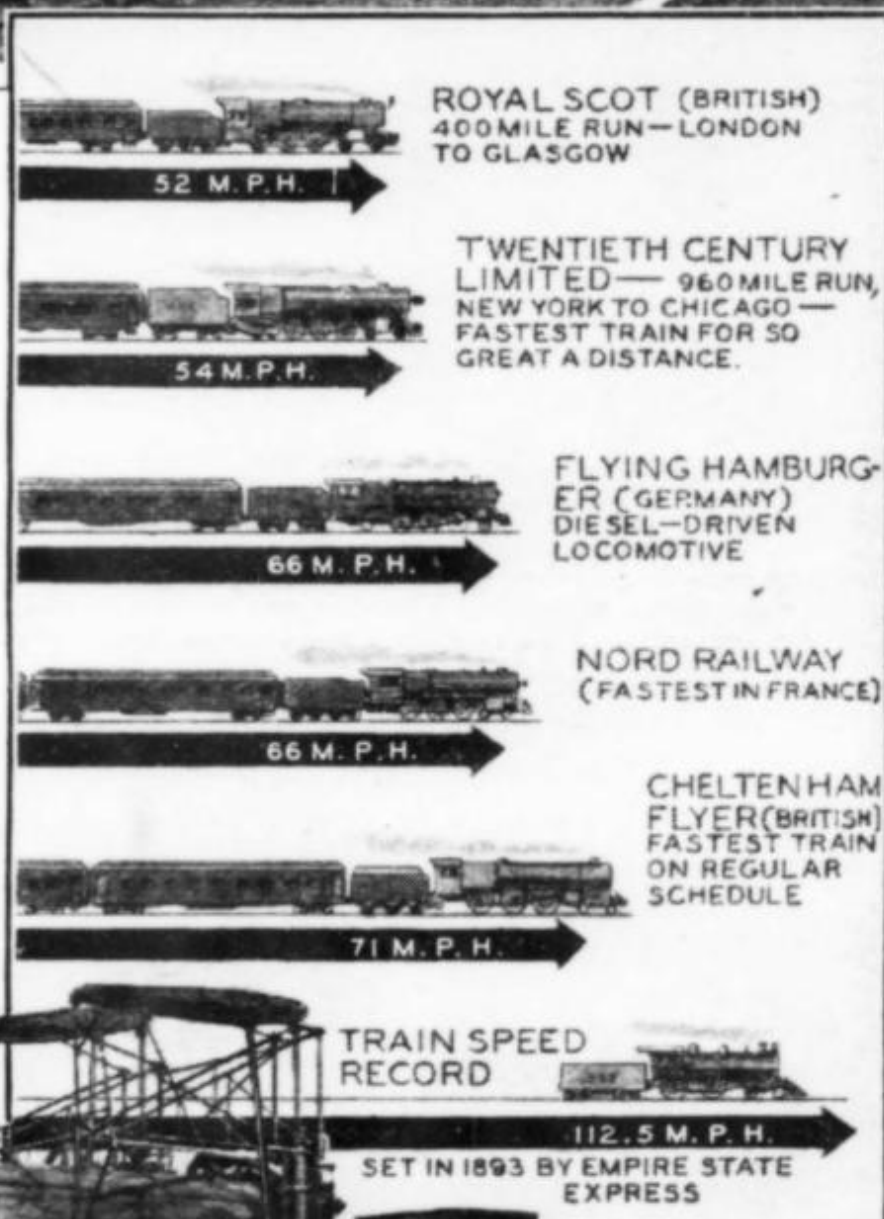
The Royal Scot, England's most famous train, is on exhibit at the Century of Progress. British locomotives cannot approach American engines in size because of restrictions as to clearance and size made necessary by low bridges, etc.

it is entitled to be taken seriously. His method of holding the car to the rails at extreme speeds by mounting the wheels at a thirty degree angle is ingenious. With this difficulty overcome, it is a simple problem in mechanics to install a motor powerful enough to drive the train at airplane speed.

Most train speed records, as shown on an accompanying chart, rest in European hands. It must be remembered, however, that trains are rigidly kept below certain speeds for reasons of operation. Wear and tear, fuel consumption, possibility of accident or derailment, and dozens of other factors hold down American train speeds below what could easily be attained. Weight of cars is much greater in this country than in Europe.

Nevertheless, an interesting sidelight on the rate of advance of rail design is afforded by the fact that the speed record of 112.5 miles an hour still stands—and this was set 40 years ago when famous old Engine 999 hauled the Empire State Express at this rate. The 112.5 miles an hour speed is just about what a well streamlined train should do hour after hour if Mr. Train Rider is to be satisfied that the railway is keeping up to date.

Inventions for August



larger but not essentially different from the first engine used in America.

Various speed records for trains are given in the drawing above. Note that the highest speed record has remained untouched for 40 years. For that matter, today's locomotives are

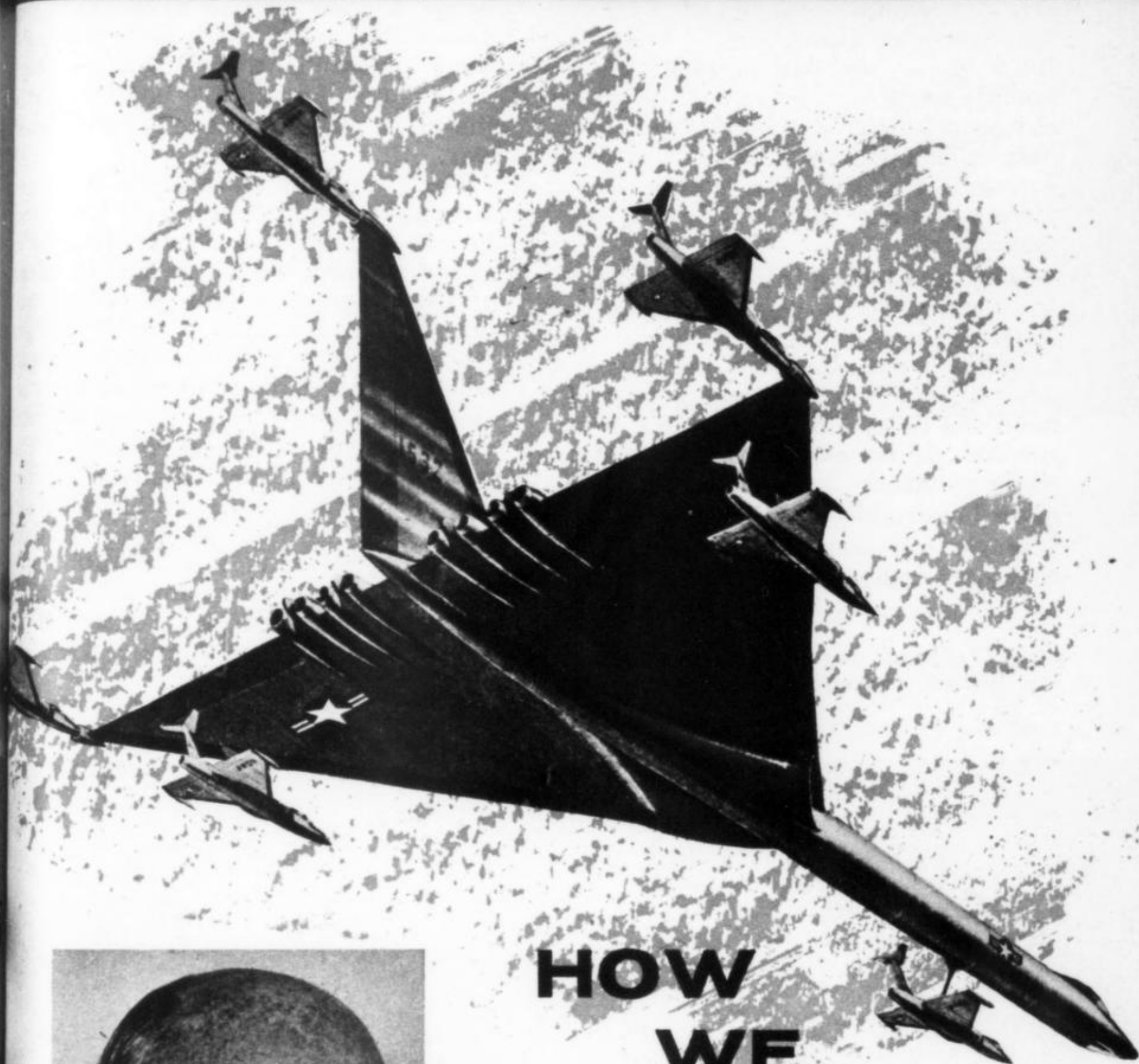
January • February • March • April

May • June • July **August**

September • October • November • December

Mechanix Illustrated

1959



HOW WE BUNGLED THE *Atom-Powered* PLANE

By Rep. Melvin Price:
Chairman, Subcommittee on
Research and Development,
Joint Committee on Atomic
Energy, U.S. Congress,
As told to Arthur Kranish

CONTINUED...

SOMETIME this year the Russians will fly an atomic-powered airplane. This country could have had one in the air—but is now years behind. I believe the American public should know the facts behind this billion-dollar bungle and the many, many years of disastrous indecision, indifference and ineffectiveness which will hand the Communists a stunning propaganda and technical victory the day their nuclear-powered plane flies.

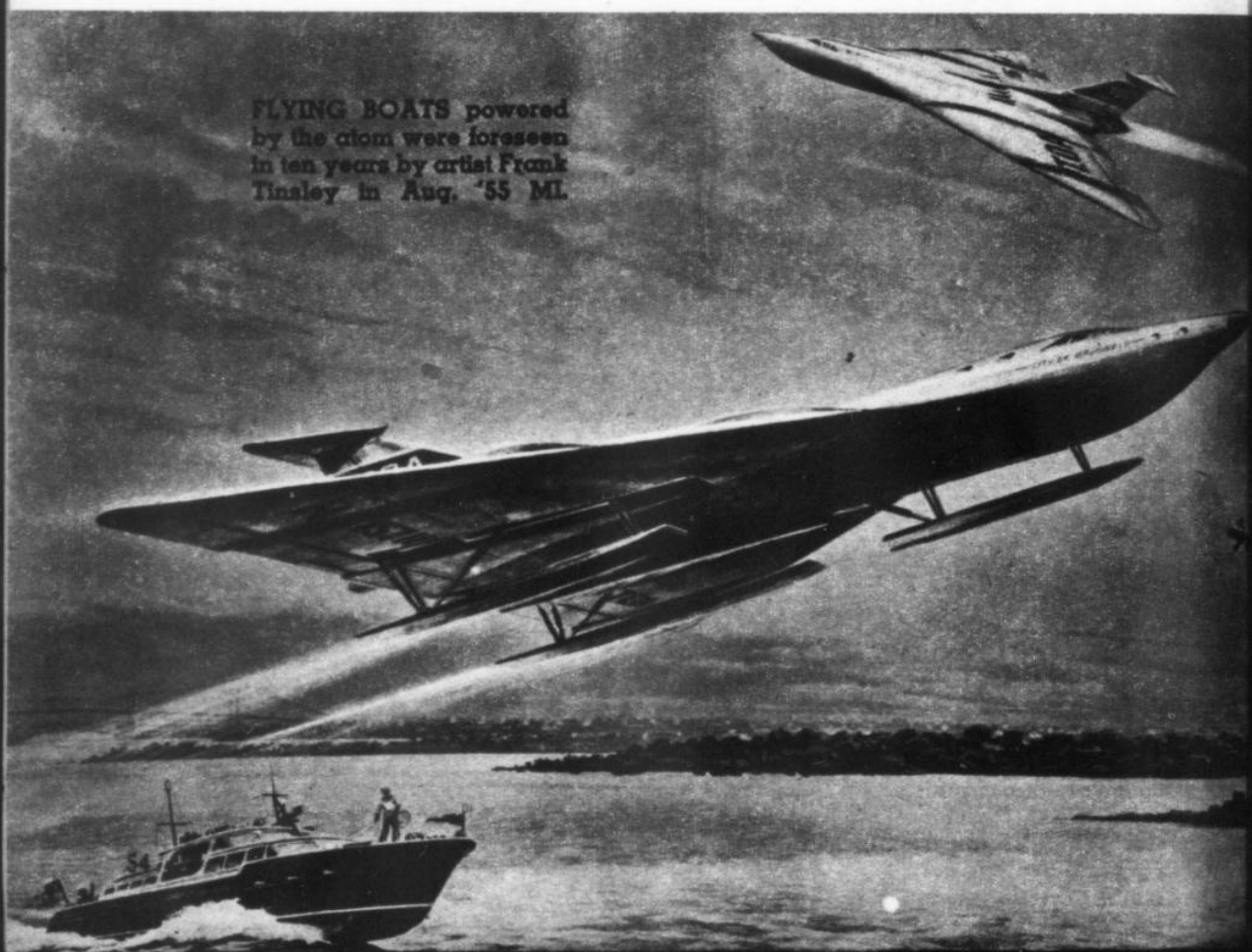
Why am I telling this story? Because, as a member of the Joint Congressional Committee on Atomic Energy and as Chairman of its Research and Development Subcommittee, I have seen at first hand the delays, confusions and rivalries which have plagued the atomic plane program from the start. But—more important—I want you to know how we can pick up the pieces and really get rolling on this vital project. I

PHOTO of plane on preceding page is Northrup Aircraft conception of atomic bomber.

want you to know how the U. S. can recapture at least some of the worldwide prestige which a nuclear plane can bring. I want you to know how our armed services can still have this awesome aircraft in their arsenal. I want you to know some of the implications of the atom plane in peace, as well as in war.

For years our atom plane has been wrapped in military secrecy. The public has had little or no opportunity to gauge our progress, or lack of it. Much of the program is still classified, and properly so. However, I firmly believe the public is entitled to know exactly where we are today. These are the cold facts: either we push forward with vigor to a successful conclusion of this project, or we forfeit technical leadership to the Russians in another vital scientific field. Either we write off the prime objectives of a billion dollars of research and development, or we marshal our resources in a concerted attempt to power an aircraft with the atom.

FLYING BOATS powered by the atom were foreseen in ten years by artist Frank Tinsley in Aug. '55 ML



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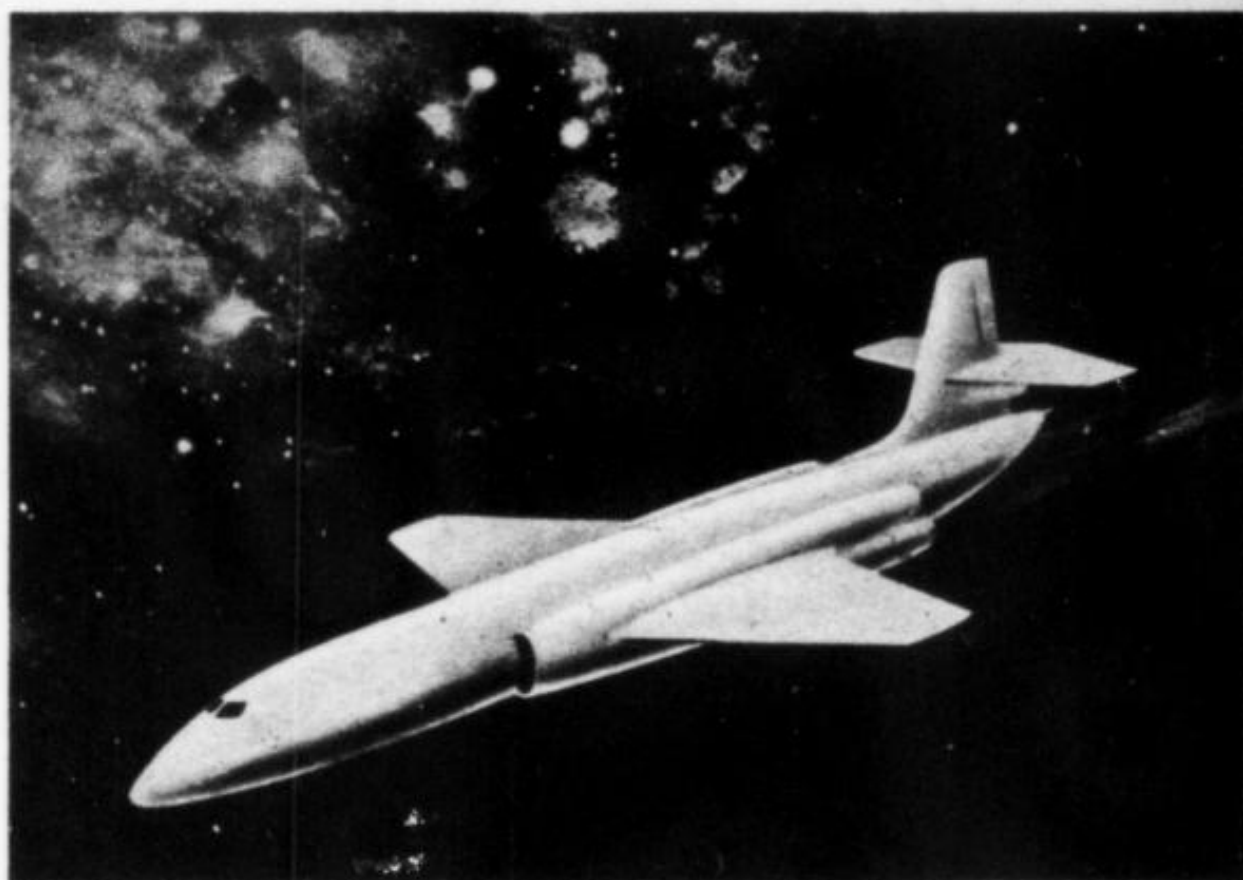
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Hardworking scientists and engineers in the field tell me that they can make an atomic airplane fly, but every time they believe their objective is within reach the rug is pulled out from under them by bureaucratic snafus in Washington.

To me, and to others familiar with the program, this situation is frankly incredible. Yet, this is the present status of our atomic plane efforts:

- The atomic aircraft program still has no firm set of objectives.
- No decision has been made regarding actual nuclear flight and no target dates have been set.
- The project's purse strings have been pulled so tight that achievement of nuclear flight will be again delayed by many months and possibly years.

Meanwhile, my own visits and talks with Russian scientists, and other information I have received, convince me that the Communists



AMERICAN nuclear bomber may look like this according to the Lockheed Aircraft Corp.

are forging ahead toward early flight. In fact, they may be very close to achieving this goal.

Why are we behind in this struggle? Why cannot the great technical skills of American science and industry produce an atomic plane that can fly? The answer is that we are behind chiefly because the familiar Washington run-around has sidetracked this project time and time again.

ANP (Aircraft Nuclear Propulsion), in its 12 years of existence, has been "reviewed" almost to death. Every time a forward step is achieved, a panel of experts has been called in to evaluate the project. No less than seven "advisory" groups have been set up in this time.

We are not behind in this effort because of a late start. In fact, Air Force officials actually began discussions with atomic experts about an atomic plane as far back as 1944—15 years ago. By 1946 the first real work to prove feasibility was under way at Oak Ridge, Tenn. For the next few years money was barely adequate but no real roadblocks were placed in the project's path. By 1948 the so-called Lexington Committee, mostly professors from the Massachusetts Institute of Technology, had reviewed the program and recommended that it be continued. Other technical advisory groups made [Continued on page 155]



RUSSIAN atom plane sketch shows nuclear power plants suspended from pods midway under its delta wing. Aviation Week photo.

THIS month MIMI tests the Devco, a new \$19.95 chemical cooker that burns LP gas flamelessly on a catalytic screen. It cooks flat or upright. "The things I long for are simple and few," hums MIMI. "A pound of hamburger, a Devco, and you." •

Oxy-Catalyst, Inc., Wayne, Pa.

MIMI



OF MECHANIX ILLUSTRATED

JUNE

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Sand Sailer
See Page 68

ONE-STEP CAMERA THAT PRINTS ITS OWN PICTURES
HOW TO HANDLE A CANOE Picture Story in Full Color
BUILD AN 11-FOOT BOAT THAT FITS YOUR CAR TRUNK

mechanix illustrated

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JUNE, 1947

VOL. XXXVIII, No. 2

On the cover: Color photo of Sand Sailer, by Ardean Miller, FPG

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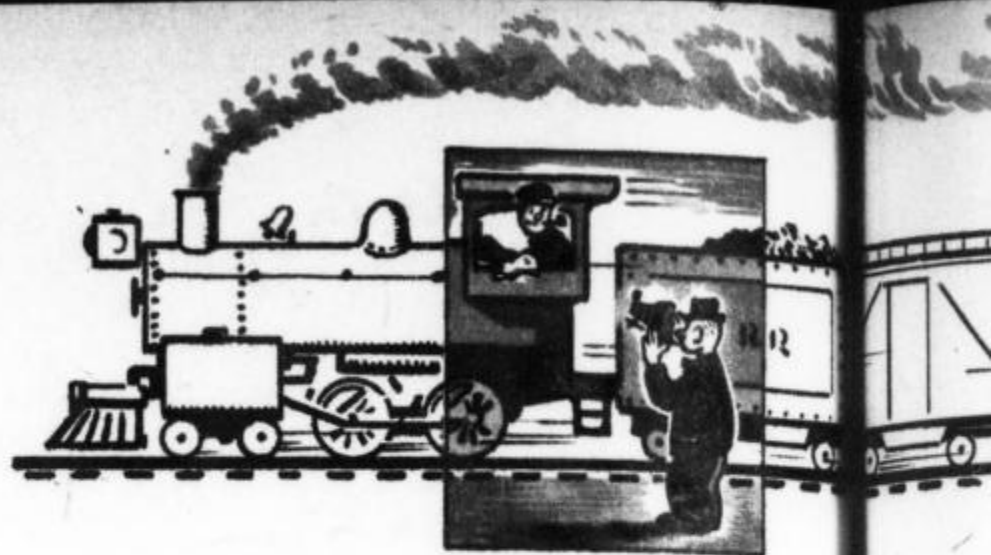
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One-Step Camera

revolution in photography



A finished photo. 60 seconds after you shoot it—with the Land one-step process.

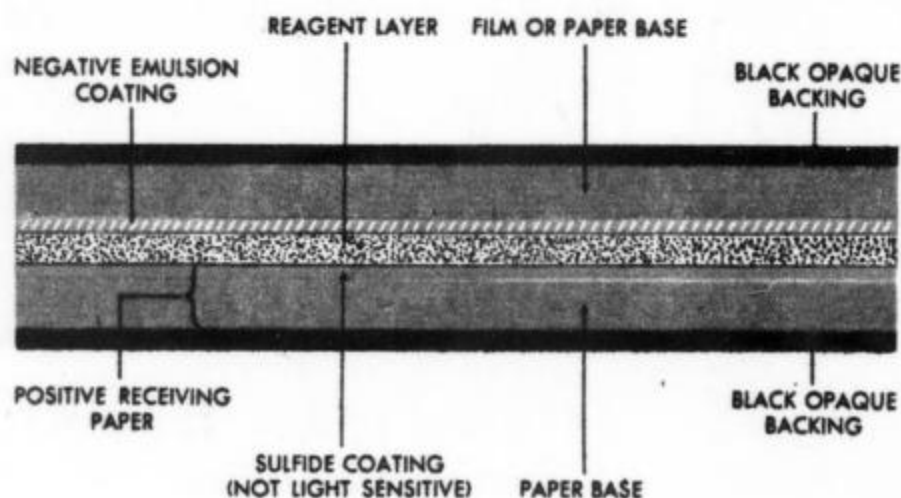
WHEN the Edwin H. Land "one-step" process was demonstrated for the first time before a recent New York meeting of the Optical Society of America, it was billed as "a new kind of photography as revolutionary as the transition from wet plates to daylight loading film."

After attending a sober and unhurried.

repeat demonstration of the process by Mr. Land and his assistants at the Parker House in Boston, and analyzing the technical reports published since then, this writer considers the enthusiastic reaction of the daily press and the public fully justified.

"Instantaneous photography" has been a

fig. 1



Left: Cross-section of negative-reagent-positive sandwich—while one-step print is being processed.

Right: How pod containing processing chemicals is attached to positive paper.

Below: Section of a typical camera designed for making "1-minute pictures."

fig. 2

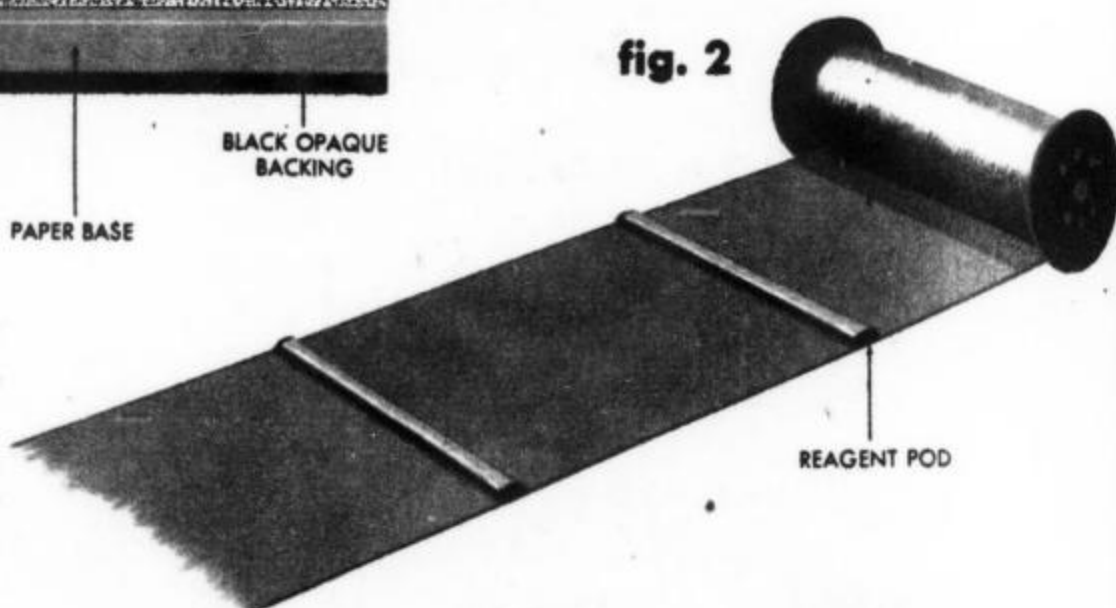
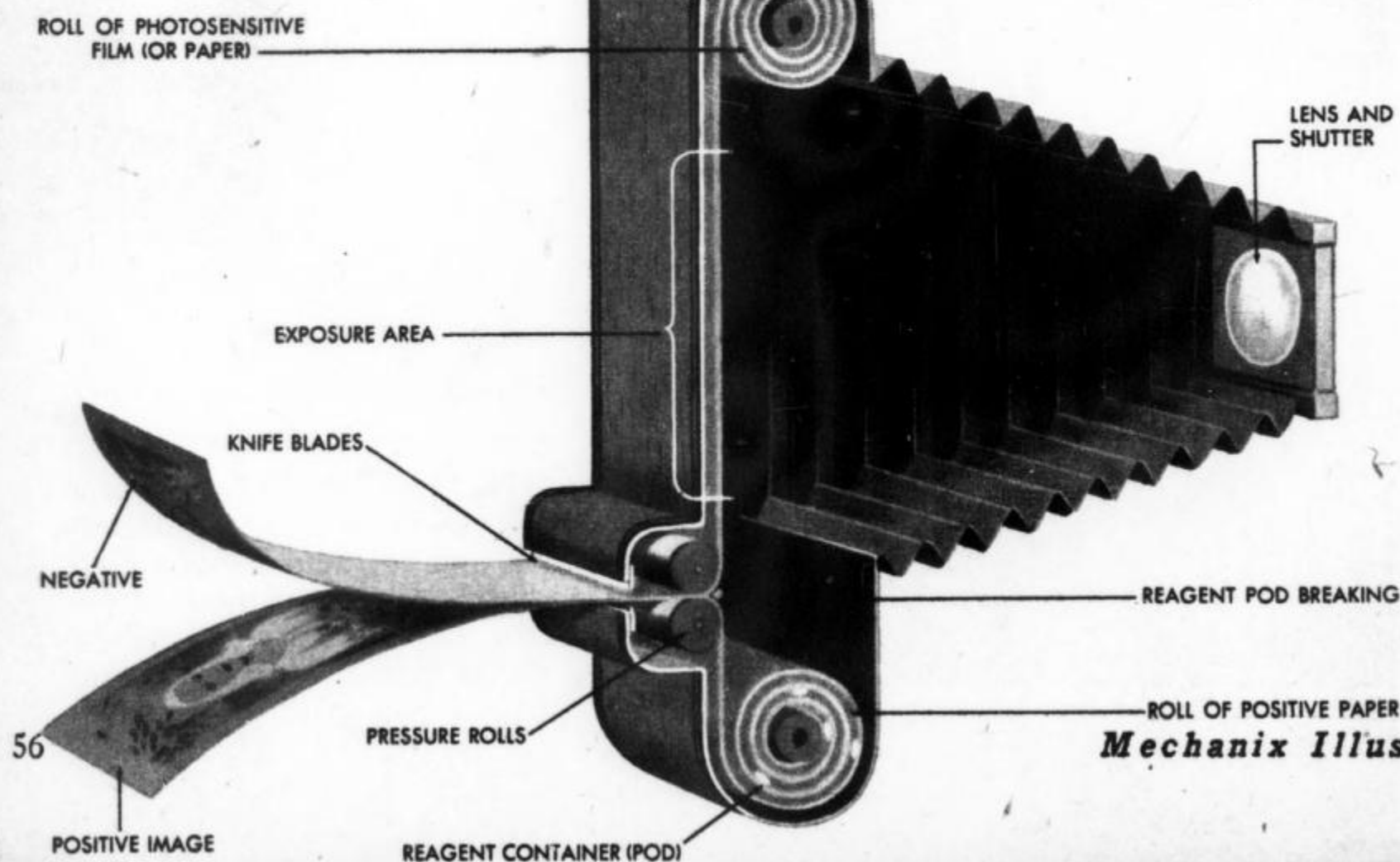
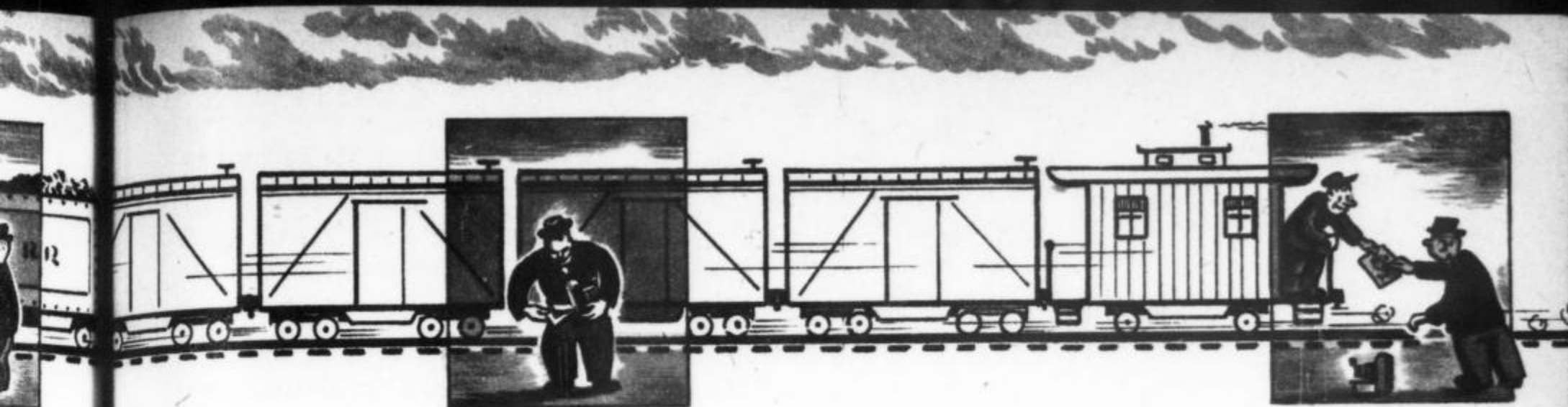


fig. 3



Mechanix Illustrated



BY NORMAN C. LIPTON

long-cherished dream of press photographers, newspaper editors and the millions and millions of amateurs who do 99% of their picture shooting around the house, at the beach or swimming hole, or on vacation trips. The Land one-step process should realize that dream within the foreseeable future.

Here's how a typical Land camera (Figure 3) works:

You snap the camera shutter and immediately turn the film advancing knob which forces a "sandwich" of negative and print material out through a slit at the back of the camera. After 40 to 50 secs., you tear the sandwich away from the camera and peel it apart. In one hand, you have a practically dry, finished print; and in the other, a discardable negative on paper base—only 60 seconds after snapping the shutter!

Duplicate prints are made by "copying" the original, print by the same process. No darkroom is needed for any phase of the process. It can all be done in daylight.

The above procedure, which was demonstrated in principle at the Optical Society meeting and at the Parker House press conference, is one of several quick photography processes devised by Mr. Land, who also developed the light-polarizing plastic, Polaroid. (He is president and research director of the Polaroid Corp., Cambridge, Mass.) In a simple variation of the foregoing procedure, ordinary rollfilm, producing a transparent, re-usable negative, may be used in place of paper negative material. The basic process uses a paper negative only because it costs about $\frac{1}{4}$ as much as an identical negative emulsion (Verichrome) coated on regular, transparent film base.

The first demonstration of "one-minute photography" took place just as it emerged from the research laboratory, and a commercial product can't reasonably be ex-

pected to turn up on the market tomorrow or next week. But, we do have the assurance of Polaroid Corp. officials that a camera employing one of the Land one-step processes is *now being designed for large scale production*. The cost and availability date will be announced "in the near-future."

Apparently, the commercial version of one-step photography is being aimed at the mass amateur market for 75% of amateur photo finishing today is for "first prints" only. However, we were assured that the needs of professionals and other specialized photographic workers would be taken care of in due time.

If you do not purchase a special "one-step camera" with a slit back and a pair of pressure rollers like the one illustrated in Figure 3, you should be able to equip any regular camera, having a removable



Right: Edwin H. Land, demonstrating one of his 1-step photography processes, peels apart a practically dry, finished print from (paper base) negative.



Home "darkroom" of the future—for ordinary roll-film negatives, exposed in conventional cameras. Merely load negative roll in light-tight box containing "receiving paper" roll, and equipped with pressure rollers and exit slit—like 1-step camera.

back, with a simple "one-step adapter" that includes the necessary features. At the formal demonstrations, an adapter for the Speed Graphic and another for a large view camera were shown, and used. Standard film packs are particularly suitable for the installation of the pressure rollers needed in the process.

Note, in Figure 3, that the roll of negative film or paper is placed where the film normally goes in regular rollfilm cameras, while the roll of "receiving" paper, on which the positive print image forms, is loaded in the take-up spool position. The receiving paper is coated with sodium sulfide crystals in strategically distributed clusters, and it is NOT light sensitive. All of the processing chemicals are contained in the thin, hermetically sealed reagent pod that runs across the width of the paper at the beginning of each frame length (Figure 2). As the exposed negative material and the corresponding frame of receiving paper begin to pass between the pair of pressure rollers, the pod is broken and the viscous liquid contained within it (consisting of hydroquinone, hypo, water, sodium hydroxide, sodium sulfite and a plastic—in a highly alkaline medium) rolls out in the form of a bead. In the resulting sandwich, which protrudes through the slit at the back of the camera, the reagent "solution" is spread out between the surfaces of the negative and print materials in a layer about .0001 inch thick. The sandwich is enclosed between the opaque backings of the negative and print materials (Figure 1) to prevent fogging by light.

While the elements of the negative-reagent-positive sandwich remain together, hydroquinone diffuses from the reagent layer into the negative emulsion and rapidly reduces to metallic silver all the photo-sensitive silver halide particles that were exposed when the shutter was snapped. Hypo too diffuses from the re-

agent layer into the negative emulsion (at about the same rate) and combines with the silver ion of each silver halide particle that has not been affected by the exposure light. While the exposed silver remains in the negative emulsion, the silver from the unexposed particles, chemically bonded with the hypo, travels quickly into the reagent layer where hydroquinone develops it into metallic silver. (This frees it from the hypo, which can return to the negative emulsion for more unexposed silver ions.) The metallic silver is then quickly deposited on the surface of the receiving paper to form the shadows and half-tones of the positive print image—by means of a physical action involving the sodium sulfide crystals on the paper surface. Thus, the unexposed silver particles that are not needed in the formation of the negative image are fully utilized in the making of the positive print.

The temperature tolerance of the one-step process, above, was engineered to produce uniform print quality over a range extending from 30 to 100 degrees F., with the suggestion that the sandwich be peeled after 90 seconds of contact (instead of 40-50 seconds) at lower temperature extremes; and after 30 seconds at higher temperatures. At average operating temperatures, varying the peeling time between 30 and 90 seconds was said to vary print contrast over a range of two grades of negative-to-positive printing paper.

Contrast can also be controlled by using different negative emulsions, receiving paper and chemical reagents (in the pod).

The quality of one-step prints turned out at the Boston demonstration as well as older prints exhibited there seemed uniformly good. Whites were clear; half-tones were well separated, and deepest blacks and chocolate browns (where warmer tones were produced purposely, by varying the reagent pod contents) seemed rich. Although the quality fell short of professional illustrators' and advanced pictorialists' standards, it was superior to the general run of commercial photo-finishing. In explaining the streakiness evident in most of the larger (8x10-inch) prints, Mr. Land stated that this fault was due to uneven machine-coating of the receiving paper, and was not a result of uneven spreading of the viscous reagent by the pressure rollers. Smaller one-step prints made on [Continued on page 162]

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